Service Manual

Model : LG-P500

Internal Use Only

Service Manual

LG-P500

Date: September, 2010 / Issue 1.0

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1. INTRODUCTION

1.1 Purpose

This manual provides the information necessary to repair, calibration, description and download the features of this model.

1.2 Regulatory Information

A. Security

Toll fraud, the unauthorized use of telecommunications system by an unauthorized part (for example, persons other than your company's employees, agents, subcontractors, or person working on your company's behalf) can result in substantial additional charges for your telecommunications services. System users are responsible for the security of own system. There are may be risks of toll fraud associated with your telecommunications system. System users are responsible for programming and configuring the equipment to prevent unauthorized use. The manufacturer does not warrant that this product is immune from the above case but will prevent unauthorized use of common carrier telecommunication service of facilities accessed through or connected to it. The manufacturer will not be responsible for any charges that result from such unauthorized use.

B. Incidence of Harm

If a telephone company determines that the equipment provided to customer is faulty and possibly causing harm or interruption in service to the telephone network, it should disconnect telephone service until repair can be done. A telephone company may temporarily disconnect service as long as repair is not done.

C. Changes in Service

A local telephone company may make changes in its communications facilities or procedure. If these changes could reasonably be expected to affect the use of the phones or compatibility with the net work, the telephone company is required to give advanced written notice to the user, allowing the user to take appropriate steps to maintain telephone service.

D. Maintenance Limitations

Maintenance limitations on the phones must be performed only by the manufacturer or its authorized agent. The user may not make any changes and/or repairs expect as specifically noted in this manual. Therefore, note that unauthorized alternations or repair may affect the regulatory status of the system and may void any remaining warranty.

E. Notice of Radiated Emissions

This model complies with rules regarding radiation and radio frequency emission as defined by local regulatory agencies. In accordance with these agencies, you may be required to provide information such as the following to the end user.

F. Pictures

The pictures in this manual are for illustrative purposes only; your actual hardware may look slightly different.

G. Interference and Attenuation

A phone may interfere with sensitive laboratory equipment, medical equipment, etc. Interference from unsuppressed engines or electric motors may cause problems.

H. Electrostatic Sensitive Devices

ATTENTION

Boards, which contain Electrostatic Sensitive Device (ESD), are indicated by the  **sign.**

Following information is ESD handling:

• Service personnel should ground themselves by using a wrist strap when exchange system boards. • When repairs are made to a system board, they should spread the floor with anti-static mat which is also grounded.

• Use a suitable, grounded soldering iron. • Keep sensitive parts in these protective packages until these are used.

• When returning system boards or parts like EEPROM to the factory, use the protective package as described.

1.3 Abbreviations

For the purposes of this manual, following abbreviations apply:

APC	Automatic Power Control
BB	Baseband
BER	Bit Error Ratio
CC-CV	Constant Current – Constant Voltage
DAC	Digital to Analog Converter
DCS	Digital Communication System
dBm	dB relative to 1 milli watt
DSP	Digital Signal Processing
EEPROM	Electrical Erasable Programmable Read-Only Memory
ESD	Electrostatic Discharge
FPCB	Flexible Printed Circuit Board
GMSK	Gaussian Minimum Shift Keying
GPIB	General Purpose Interface Bus
GSM	Global System for Mobile Communications
IPUI	International Portable User Identity
IF	Intermediate Frequency
LCD	Liquid Crystal Display
LDO	Low Drop Output
LED	Light Emitting Diode
OPLL	Offset Phase Locked Loop

PAM	Power Amplifier Module
PCB	Printed Circuit Board
PGA	Programmable Gain Amplifier
PLL	Phase Locked Loop
PSTN	Public Switched Telephone Network
RF	Radio Frequency
RLR	Receiving Loudness Rating
RMS	Root Mean Square
RTC	Real Time Clock
SAW	Surface Acoustic Wave
SIM	Subscriber Identity Module
SLR	Sending Loudness Rating
SRAM	Static Random Access Memory
PSRAM	Pseudo SRAM
STMR	Side Tone Masking Rating
TA	Travel Adapter
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
UART	Universal Asynchronous Receiver/Transmitter
VCO	Voltage Controlled Oscillator
VCTCXO	Voltage Control Temperature Compensated Crystal Oscillator
WAP	Wireless Application Protocol

2. PERFORMANCE

2.1 Product Name

LGP500 : WCDMA900/2100+EGSM/GSM850/DCS/PCS

(HSDPA 7.2Mbps GPRS Class 10 / EDGE Class 10)

2.2 Supporting Standard

Item	Feature	Comment
Supporting Standard	WCDMA(FDD1,8)/EGSM/GSM850/DCS1800/PCS1900 with seamless handover Phase 2+(include AMR) SIM Toolkit: Class 1, 2, 3, C-E	
Frequency Range	WCDMA(FDD1) TX : 1920 – 1980 MHz WCDMA(FDD1) RX : 2110 – 2170 MHz WCDMA(FDD8) TX : 880 – 915 MHz WCDMA(FDD8) RX : 925 – 960 MHz EGSM TX: 880 – 915 MHz EGSM RX: 925 – 960 MHz GSM850 TX: 824 – 849 MHz GSM850 RX: 869 – 894 MHz DCS1800 TX : 1710 – 1785 MHz DCS1800 RX: 1805 – 1880 MHz PCS1900 TX: 1850 – 1910 MHz PCS1900 RX: 1930 – 1990 MHz	
Application Standard	WAP 2.0	

2.3 Main Parts : GSM Solution

Item	Part Name	Comment
Digital Baseband	MSM7227 : Qualcomm	
Analog Baseband	PM7540 : Qualcomm	
RF Chip	RTR6285 : Qualcomm	

2.4 HW Features

Item		Feature	Comment
Form Factor		DOP type	
Battery		1) Capacity Standard : Li-Ion polymer, 1500mAh	
		2) Packing Type : Soft Pack	
Size		Standard : 113.5 x 59 x 13.3 mm	
Weight		127g With Battery	
Volume		TBD	
PCB		L1B1 type, 10 Layers , 0.8t	
Stand by time		2G Up to 350 hrs 3G Up to 3500 hrs	@ Paging Period 9 (2G) @ DRX 7 (3G)
Charging time		3 hrs	@ Power Off / 1500mAh
Talk time		2G Up to 250mins 3G Up to 250mins	@ Power Level 5 (2G) @ Tx = 12dBm (3G)
RX sensitivity		WCDMA(FDD1) : -106.7 dBm WCDMA(FDD8) : -103.7 dBm EGSM : -105 dBm GSM850 : -105 dBm DCS 1800 : -105 dBm PCS 1900 : -105 dBm	
TX output power	WCDMA/ GSM/ GPRS	WCDMA : 24dBm/3.84MHz,+1/-3dBm EGSM : 33dBm GSM850 : 33 dBm DCS 1800 : 30 dBm PCS 1900 : 30 dBm	Class3(WCDMA) Class4 (EGSM) Class4 (GSM850) Class1 (PCS) Class1 (DCS)
	EDGE	GSM 900 : 27 dBm DCS 1800 : 26 dBm PCS 1900 : 26 dBm	E2 (GSM900) E2 (PCS) E2 (DCS)
GPRS compatibility		GPRS Class 10	
EDGE compatibility		EDGE Class 10	
SIM card type		Plug-In SIM 3V /1.8V	

Display	Main LCD TFT Main LCD(3.2', 320 x 480)	
Built-in Camera	3M CMOS Camera	
Status Indicator	No	
Keypad	Function Key : 4 Side Key : 3	Function Key: Home, Back, Menu, Search Side Key : Volume up/down, Power Key
ANT	Main : Internal Fixed Type	
System connector	5 Pin	
Ear Phone Jack	3.5Phi, 4 Pole, Stereo	
PC synchronization	Yes	
Memory	NAND Flash : 4Gbit SDRAM : 4Gbit	
Speech coding	FR, EFR, HR,AMR	
Data & Fax	Built in Data & Fax support	
Vibrator	Built in Vibrator	
Blue Tooth	V2.1+ EDR	
MIDI(for Buzzer Function)	SW Decoded 72Poly	
Music Player	MP3/ WMA/AAC/HE-AAC/EAAC+	
Video Player	MPEG4, H.263, WMV9	
Camcorder	MPEG4, H.263,	
Voice Recording	Yes	
Speaker Phone mode Support	Yes	
Travel Adapter	Yes	
CDROM	No	
Stereo Headset	Yes	
Data Cable	Yes	
T-Flash (External Memory)	Yes	

2.5 SW Features

Item	Feature	Comment
RSSI	0 ~ 4 Levels	
Battery Charging	0 ~ 6 Levels	
Key Volume	0 ~ 7 Level	
Audio Volume	1 ~ 15 Level	
Time / Date Display	Yes	
Multi-Language	Yes	English/French/German/Spanish/Italian/Danish/Dutch/Korean
Quick Access Mode	Dialing/ Contact / Menu / Message / Camera	
PC Sync	No	
Speed Dial	No	Voice mail center -> 1 key
Profile	Yes	not same with feature phone setting
CLIP / CLIR	Yes	
Phone Book	Name / Number / Email / Chat Id/ Website/Postal addresses/Organizations/Groups/ BirthdayNotes / Ringtone	There is no limitation on the number of items. It depends on available memory amount.
Last Dial Number	Yes	Last Dial Numbers, Last Received Numbers and Last Missed Numbers can store up to a total of 500.
Last Received Number	Yes	Last Dial Numbers, Last Received Numbers and Last Missed Numbers can store up to a total of 500.
Last Missed Number	Yes	Last Dial Numbers, Last Received Numbers and Last Missed Numbers can store up to a total of 500.
Search by Number / Name	Name	
Group	Yes	There is no limitation on the number of items. It depends on available memory amount.
Fixed Dial Number	Yes	

Service Dial Number	No	
Own Number	Yes	Read only (add/edit/delete are not supported)
Voice Memo	Yes	
Call Reminder	No	
Network Selection	Automatic	
Mute	Yes	
Call Divert	Yes	
Call Barring	Yes	
Call Charge (AoC)	Yes	
Call Duration	Yes	
SMS (EMS)	There is no limitation on the number of items. It depends on available memory amount.	EMS does not support.
SMS Over GPRS	No	
EMS Melody / Picture	No	
Send / Receive / Save	No	
MMS MPEG4 Send / Receive / Save	Yes	
Long Message	MAX 459 characters	SMS 3pages
Cell Broadcast	Yes	
Download	Over the Web	
Game	Yes	
Calendar	Yes	
Memo	Yes	There is no limitation on the number of items. It depends on available memory amount.
World Clock	No	
Unit Convert	No	
Stop Watch	No	
Wall Paper	Yes	

WAP Browser	No	Support only web browser based on webkit. WAP stack and wml are not supported.
Download Melody / Wallpaper	Yes	Over web browser
SIM Lock	Yes	Operator Dependent
SIM Toolkit	Class 1, 2, 3, C	
MMS	Yes	Google MMS Client
EONS	Yes	
CPHS	Yes	V4.2
ENS	No	
Camera	Yes	5M AF / Digital Zoom : x4
JAVA	Yes	CLDC V1.1 / MIDP V2.1 Download Over Web
Voice Dial	No	
IrDa	No	
Bluetooth	Yes	Ver. 2.1+EDR (HSP,HFP,A2DP,AVRCP)
FM radio	Yes	
GPRS	Yes	Class 10
EDGE	Yes	Class 10
Hold / Retrieve	Yes	
Conference Call	Yes	Max. 6
DTMF	Yes	
Memo pad	No	
TTY	No	
AMR	Yes	
SyncML	Yes	
IM	Yes	
Email	Yes	

2.6 HW SPEC.

1) GSM transceiver specification

Item	Specification
Phase Error	Rms : 5° Peak : 20 °
Frequency Error	GSM : 0.1 ppm DCS/PCS : 0.1 ppm
EMC(Radiated Spurious Emission Disturbance)	GSM/DCS : < -28dBm
Transmitter Output power and Burst Timing	GSM : 5dBm – 33dBm ± 3dB DCS/PCS : 0dBm – 30dBm ± 3dB
Burst Timing	<3.69us
Spectrum due to modulation out to less than 1800kHz offset	200kHz : -36dBm 600kHz : -51dBm/-56dBm
Spectrum due to modulation out to larger than 1800kHz offset to the edge of the transmit band	GSM : 1800-3000kHz :< -63dBc(-46dBm) 3000kHz-6000kHz : <-65dBc(-46dBm) 6000kHz < : < -71dBc(-46dBm) DCS : 1800-3000kHz :< -65dBc(-51dBm) 6000kHz < : < -73dBc(-51dBm)
Spectrum due to switching transient	400kHz : -19dBm/-22dBm(5/0), -23dBm 600kHz : -21dBm/-24dBm(5/0), -26dBm
Reference Sensitivity – TCH/FS	Class II(RBER) : -105dBm(2.439%)
Usable receiver input level range	0.012(-15 - -40dBm)
Intermodulation rejection – Speech channels	± 800kHz, ± 1600kHz : -98dBm/-96dBm (2.439%)
AM Suppression – GSM : -31dBm - DCS : -29dBm	-98dBm/-96dBm (2.439%)
Timing Advance	± 0.5T

2) WCDMA transmitter specification

Item	Specification
Transmit Frequency	Band1 : 1920 MHz ~ 1980 MHz Band8 : 880MHz~915MHz
Maximum Output Power	+24 dBm / 3.84 MHz, +1 / -3 dB
Frequency Error	within ±0.1 PPM
Open Loop Power Control	Normal Conditions : within ±9 dB, Extreme Conditions : within ±12 dB
Minimum Transmit Power	< -50 dBm /3.84 MHz
Occupied Bandwidth	< 5 MHz at 3.84 Mcps (99% of power)
Adjacent Channel Leakage Power Ratio (ACLR)	> 33 dB @ ±5 MHz, > 43 dB @ ±10 MHz
Spurious Emissions |f-fc| > 12.5 MHz	< -36 dBm / 1 kHz RW @ 9 kHz ≤ f < 150 kHz < -36 dBm / 10 kHz RW @ 150 KHz ≤ f < 30 MHz < -36 dBm / 100 kHz RW @ 30 MHz ≤ f < 1 GHz < -30 dBm / 1 MHz RW @ 1 GHz ≤ f < 12.75 GHz < -60 dBm / 3.84 MHz RW @ 869 MHz ≤ f ≤ 894 MHz < -60 dBm / 3.84 MHz RW @ 1930 MHz ≤ f ≤ 1900 MHz < -60 dBm / 3.84 MHz RW @ 2110 MHz ≤ f ≤ 2155 MHz < -67 dBm / 100 kHz RW @ 925 MHz ≤ f ≤ 935 MHz < -79 dBm / 100 kHz RW @ 935 MHz < f ≤ 960 GHz < -71 dBm / 100 kHz RW @ 1805 MHz ≤ f ≤ 1880 MHz < -41 dBm / 300 kHz RW @ 1884.5 MHz < f < 1919.6 MHz
Transmit Intermodulation	< -31 dBc @ 5 MHz & < -41 dBc @ 10 MHz when Interference CW Signal Level = -40 dBc
Error Vector Magnitude	< 17.5 %, when Pout ≥ -20 dBm
Peak Code Domain Error	< -15 dB at Pout ≥ -20 dBm

3) WCDMA receiver specification

Item	Specification
Receive Frequency	Band1 : 2110 ~ 2170 MHz Band8 : 925~960MHz
Reference Sensitivity Level	Band1 : BER < 0.001 when Îor = -106.7 dBm / 3.84 MHz Band8 : BER < 0.001 when Îor = -103.7 dBm / 3.84 MHz
Maximum Input Level	BER < 0.001 when Îor = -25 dBm / 3.84 MHz
Adjacent Channel Selectivity (ACS)	ACS > 33 dB where BER < 0.001 when Îor = -92.7 dBm / 3.84 MHz & Ioac = –52 dBm / 3.84 MHz @ ±5 MHz
Blocking Characteristic	BER < 0.001 when Îor = -103.7 dBm / 3.84 MHz & Iblocking = -56 dBm / 3.84 MHz @ Fuw(offset) = ±10 MHz or Iblocking = -44 dBm / 3.84 MHz @ Fuw(offset) = ±15 MHz
Spurious Response	BER < 0.001 when Îor = -103.7 dBm / 3.84 MHz & Iblocking = -44 dBm
Intermodulation	BER < 0.001 when Îor= -103.7 dBm / 3.84 MHz & Iouw1 = -46 dBm @ Fuw1(offset) = ±10 MHz & Iouw2 = -46 dBm / 3.84 MHz @ Fuw2(offset) = ±20 MHz
Spurious Emissions	< -57 dBm / 100 kHz BW @ 9 kHz ≤ f < 1 GHz < -47 dBm / 1 MHz BW @ 1 GHz ≤ f ≤ 12.75 GHz
Inner Loop Power Control In Uplink	Adjust output(TPC command) cmd 1dB 2dB 3dB +1 +0.5/1.5 +1/3 +1.5/4 0 -0.5/+0.5 -0.5/+0.5 -0.5/+0.5 -1 -0.5/-1.5 -1/-3 -1.5/-4 group(10equal command group) +1 +8/+12 +16/+24

4) HSDPA transmitter specification

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td>Transmit Frequency</td><td>Band1 : 1920 MHz ~ 1980 MHz
Band8 : 880MHz~915 MHz</td></tr>
<tr><td>Maximum Output Power</td><td>Sub-Test
1=1/15, 2=12/15 21~25dBm / 3.84 MHz
3=13/15 4=15/8 20~25dBm / 3.84 MHz
5=15/7 6=15/0 19~25dBm / 3.84 MHz</td></tr>
<tr><td>HS-DPCCH</td><td>
<table>
<tr><th>Sub-test in table C.10.1.4</th><th>Power step</th><th>Power step slot boundary</th><th>Power step size, P [dB]</th><th>Transmitter power step tolerance [dB]</th></tr>
<tr><td rowspan="4">5</td><td>1</td><td>Start of Ack/Nack</td><td>6</td><td>+/- 2.3</td></tr>
<tr><td>2</td><td>Start of CQI</td><td>1</td><td>+/- 0.6</td></tr>
<tr><td>3</td><td>Middle of CQI</td><td>0</td><td>+/- 0.6</td></tr>
<tr><td>4</td><td>End of CQI</td><td>5</td><td>+/- 2.3</td></tr>
</table>
</td></tr>
<tr><td>Spectrum Emission Mask</td><td>Sub-Test : 1=1/15, 2=12/15, 3=13/15, 4=15/8, 5=15/7, 6=15/0
<table>
<tr><th>Frequency offset from carrier △f</th><th>Minimum requirement</th><th>Measurement Bandwidth</th></tr>
<tr><td>2.5 ~ 3.5 MHz</td><td>-35-15×(△f-2.5)dBc</td><td>30 kHz</td></tr>
<tr><td>3.5 ~ 7.5 MHz</td><td>-35-1×(△f-3.5)dBc</td><td>1 MHz</td></tr>
<tr><td>7.5 ~ 8.5 MHz</td><td>-35-10×(△f-7.5)dBc</td><td>1 MHz</td></tr>
<tr><td>8.5 ~ 12.5 MHz</td><td>-49dBc</td><td>1 MHz</td></tr>
</table>
</td></tr>
<tr><td>Adjacent Channel Leakage Power Ratio (ACLR)</td><td>Sub-Test : 1=1/15, 2=12/15, 3=13/15, 4=15/8, 5=15/7, 6=15/0
> 33 dB @ ±5 MHz
> 43 dB @ ±10 MHz</td></tr>
<tr><td>Error Vector Magnitude</td><td>< 17.5 %, when Pout ≥ -20 dBm</td></tr>
</table>

5) HSDPA receiver specification

Item	Specification
Receive Frequency	Band1 : 2110 ~ 2170 MHz Band8 : 925 ~ 960Hz
Maximum Input Level (BLER or R), 16QAM Only	Sub-Test : 1=1/15, 2=12/15, 3=13/15, 4=15/8, 5=15/7, 6=15/0 BLER < 10% or R >= 700kbps

6) WLAN 802.11b transceiver specification

Item	Specification
Transmit Frequency	2400 MHz ~ 2483.5 MHz (CH1~CH13)
Tx Power Level	≤ 20dBm under (Europe), ≤ 30dBm under (USA)
Frequency Tolerance	within ±25 PPM
Chip clock Frequency Tolerance	within ±25 PPM
Spectrum Mask	≤ -30 @ fc-22MHz< f <fc-11MHz and fc+11MHz< f <fc+22MHz ≤ -50 @ f < fc-22MHz and f > fc+22MHz
Power ramp on/off time	≤ 2us
Carrier Suppression	≤ -15dB
Modulation Accuracy (Peak EVM)	≤ 35%
Spurious Emissions	< -36 dBm @ 30MHz ~ 1GHz < -30 dBm above @ 1GHz ~ 12.75GHz < -47 dBm @ 1.8GHz ~ 1.9GHz < -47 dBm @ 5.15GHz ~ 5.3GHz
Rx Min input Sensitivity	≤ -76dBm(1Mbps,2Mbps,5.5Mbps,11Mbps) @ FER ≤ 8%
Rx Max input Sensitivity	≥ -10dBm(1Mbps,2Mbps,5.5Mbps,11Mbps) @ FER ≤ 8%
Rx Adjacent Channel Rejection	≥ 35dB @FER ≤ 8%, interference input signal -70dBm@fc±25MHz(11Mbps)

7) WLAN 802.11g transceiver specification

Item	Specification
Transmit Frequency	2400 MHz ~ 2483.5 MHz (CH1~CH13)
Tx Power Level	≤ 20dBm under (Europe), ≤ 30dBm under (USA)
Frequency Tolerance	within ±25 PPM
Chip clock Frequency Tolerance	within ±25 PPM
Spectrum Mask	≤ -20 @ ±11MHz offset (9Mhz ~ 11MHz) ≤ -28 @ ±20MHz offset (11MHz ~ 20Mhz) ≤ -40 @ ±30MHz offset (20MHz ~ 30Mhz)
Transmitter constellation error (rms EVM)	≤ -5dB
Spurious Emissions	< -36 dBm @ 30MHz ~ 1GHz < -30 dBm above @ 1GHz ~ 12.75GHz < -47 dBm @ 1.8GHz ~ 1.9GHz < -47 dBm @ 5.15GHz ~ 5.3GHz
Rx Min input Sensitivity	PER ≤ 10% -82dBm@6Mbps, -81dBm@9Mbps, -79dBm@12Mbps -77dBm@18Mbps, -74dBm@24Mbps, -70dBm@36Mbps -66dBm@48Mbps, -65dBm@54Mbps
Rx Max input Sensitivity	≥ -20dBm(6,9,12,18,24,36,48,54Mbps) @ PER ≤ 10%
Rx Adjacent Channel Rejection	PER ≤ 10%, ACR ≥ 16dB@6Mbps, ACR ≥ 15dB@9Mbps, ACR ≥ 13dB@12Mbps, ACR ≥ 11dB@18Mbps, ACR ≥ 8dB@24Mbps, ACR ≥ 4dB@36Mbps ACR ≥ 0dB@48Mbps, ACR ≥ -1dB@54Mbps ※ ACR shall be measured by setting the desired signal's strength 3 dB above the rate-dependent sensitivity specified in min input sensitivity

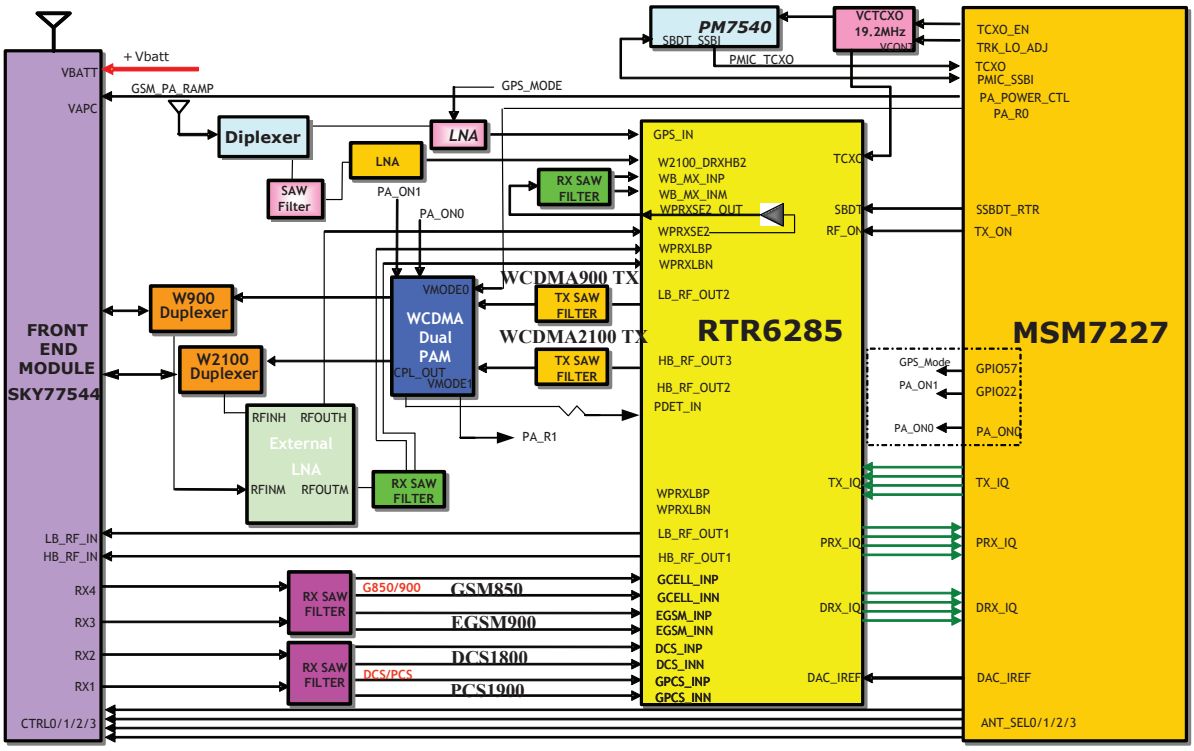
8) GPS receiver specification

Item	Specification
Receive Frequency	1574.42 MHz ~ 1576.42 MHz
Minimum Sensitivity	1 satellite ≥-142dBm, 7 satellites ≥ -147dBm at coarse time aiding

3. TECHNICAL BRIEF

3.1 GENERAL DESCRIPTION

The LG-P500 supports UMTS-900, UMTS-2100, GSM-850, GSM-850, GSM-900, GSM-1800, and GSM-1900 based GSM/GPRS/EDGE/UMTS. All receivers and the UMTS transmitter use the radioOne1Zero-IF architecture to eliminate intermediate frequencies, directly converting signals between RF and baseband. The quad-band GSM transmitters use a baseband-to-IF upconversion followed by an offset phase-locked loop that translates the GMSK-modulated or 8-PSK-modulated signal to RF.



[Figure 1-1] Block diagram of RF part

A generic, high-level functional block diagram of LGP500 is shown in Figure 1-1. One antenna collects base station forward link signals and radiates handset reverse link signals. The antenna connects with receive and transmit paths through a ASM(Antenna-Switch-Module).

The UMTS receive paths each include an LNA, an RF band-pass filter, and a downconverter that translate the signal directly from RF-to-baseband using radioOne ZIF techniques. The RFIC's Rx analog baseband outputs, for the receive chains, connect to the MSM IC. The UMTS and GSM Rx baseband outputs share the same inputs to the MSM IC.

For the transmit chains, the RTR6285 IC directly translates the Tx baseband signals (from the MSM device) to an RF signal using an internal LO generated by integrated onchip PLL and VCO. The RTR6285 IC outputs deliver fairly high-level RF signals that are first filtered by Tx SAWs and then amplified by their respective UMTS PAs. In the GSM receive path, the received RF signals are applied through their band-pass filters and down-converted directly to baseband in the RTR6285 transceiver IC. These baseband outputs are shared with the UMTS receiver and routed to the MSM IC for

further signal processing.

The GSM/EDGE transmit path employs one stage of up-conversion and, in order to improve efficiency, is divided into phase and amplitude components to produce an open-loop Polar topology:

1. The on-chip quadrature up-converter translates the GMSK-modulated signal or 8-PSK modulated signal, to a constant envelope phase signal at RF;

2. The amplitude-modulated (AM) component is applied to the ramping control pin of Polar power amplifier from a DAC within the MSM LGP500 power supply voltages are managed and regulated by the PM7540 Power Management IC. This versatile device integrates all wireless handset power management, general housekeeping, and user interface support functions into a single mixed signal IC.

It monitors and controls the external power source and coordinates battery recharging while maintaining the handset supply voltages using low dropout, programmable regulators.

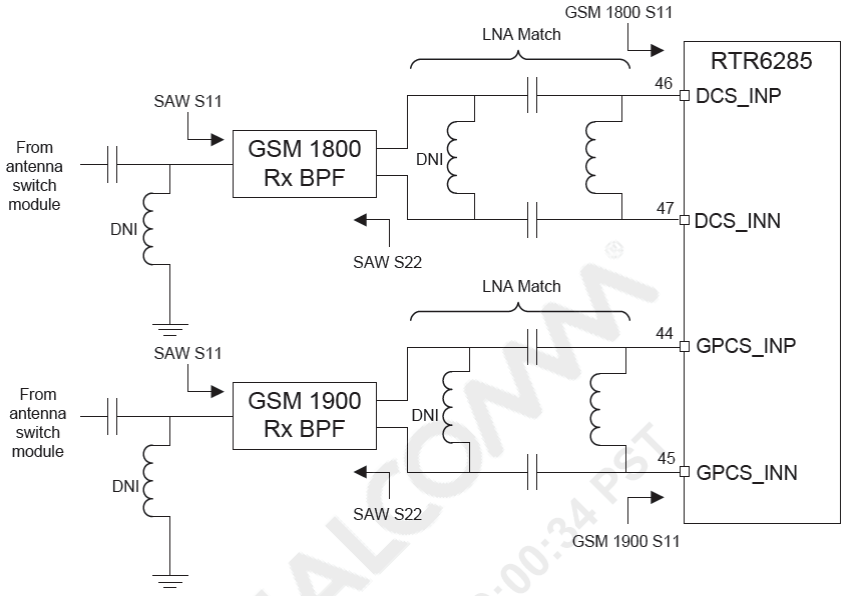
The device's general housekeeping functions include an ADC and analog multiplexer circuit for monitoring on-chip voltage sources, charging status, and current flow, as well as user-defined off-chip variables such as temperature, RF output power, and battery ID.

Various oscillator, clock, and counter circuits support IC and higher-level handset functions. Key parameters such as under-voltage lockout and crystal oscillator signal presence are monitored to protect against detrimental conditions.

3.2 GSM MODE

3.2.1 GSM RECEIVER

The GSM-850, GSM-900, GSM-1800, and GSM-1900 receiver inputs of RTR6285 are connected directly to the transceiver front-end Module. GSM-850, GSM-900, GSM-1800, and GSM-1900 receiver inputs use differential configurations to improve common-mode rejection and second-order non-linearity performance. For example Figure 1-2 shows receiver input topologies for DCS and PCS (GSM-850/900 have the same receiver input topologies). The balance between the complementary signals is critical and must be maintained from the RF filter outputs all the way into the IC pins.



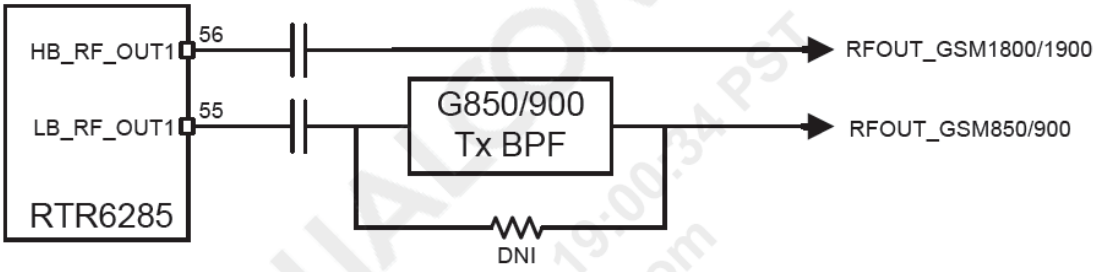
[Figure 1-2] DCS and PCS Receiver Inputs Topologies

Since GSM-850, GSM-900, GSM-1800, and GSM-1900 signals are time-division duplex (the handset can only receive or transmit at one time), switches are used to separate Rx and Tx signals in place of frequency duplexers – this is accomplished in the switch module. The GSM-850, GSM-900, GSM-1800, and GSM-1900 receive signals are routed to the RTR6285 through band selection filters and matching networks that transform single-ended 50-Ω sources to differential impedances optimized for gain and noise figure. The RTR input uses a differential configuration to improve second-order intermodulation and common mode rejection performance. The RTR6285 input stages include MSM-controlled gain adjustments that maximize receiver dynamic range.

The amplifier outputs drive the RF ports of the quadrature RF-to-baseband downconverters. The downconverted baseband outputs are multiplexed and routed to lowpass filters (one I and one Q) having passband and stopband characteristics suitable for GMSK or 8-PSK processing. These filter circuits include DC offset corrections. The filter outputs are buffered and passed on to the MSM7227 IC for further processing asshown in Figure 1-2.

3.2.2 GSM TRANSMITTER

The RTR6285 transmitter outputs(HB_RF_OUT1 and LB_RF_OUT1) include on-chip output matching inductors. 50ohm output impedance is achieved by adding a series capacitor at the output pins. The capacitor value may be optimized for specific applications and PCB characteristics based on pass-band symmetry about the band center frequency as shown in Figure 1-3.



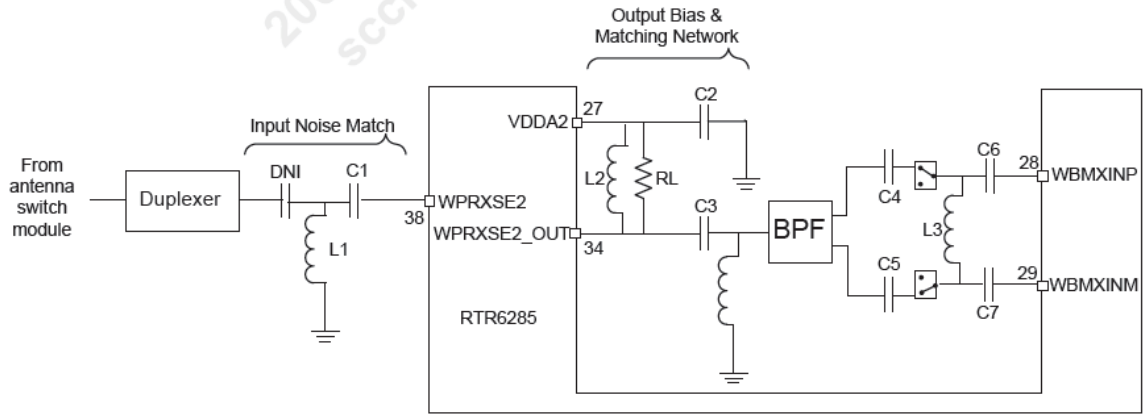
[Figure 1-3] GSM Transmitter Outputs Topologies

The RTR6285 IC is able to support GSM 850/900 and GSM 1800/1900 mode transmitting. This design guideline shows a tri-band GSM application. Both high-band and low band outputs are followed by resistive pads to ensure that the load presented to the outputs remains close to 50ohm.

3.3 UMTS MODE

3.3.1 UMTS RECEIVER

The UMTS duplexer receiver output is routed to LNA circuits within the RTR6285 device as shown in Figure 1-4. The UMTS Rx input is provided with an on-chip LNA that amplifies the signal before a second stage filter that provides differential downconverter as shown in Figure 1-5. This second stage input is configured differentially to optimize secondorder intermodulation and common mode rejection performance. The gain of the UMTS frontend amplifier and the UMTS second stage differential amplifier are adjustable, under MSM control, to extend the dynamic range of the receivers. The second stage UMTS Rx amplifiers drive the RF ports of the quadrature RF-to-baseband downconverters. The downconverted UMTS Rx baseband outputs are routed to lowpass filters having passband and stopband characteristics suitable for UMTS Rx processing. These filter circuits allow DC offset corrections, and their differential outputs are buffered to interface shared with GSM Rx to the MSM IC. The UMTS baseband outputs are turned off when the RTR6285 is downconverting GSM signals and on when the UMTS is operating.



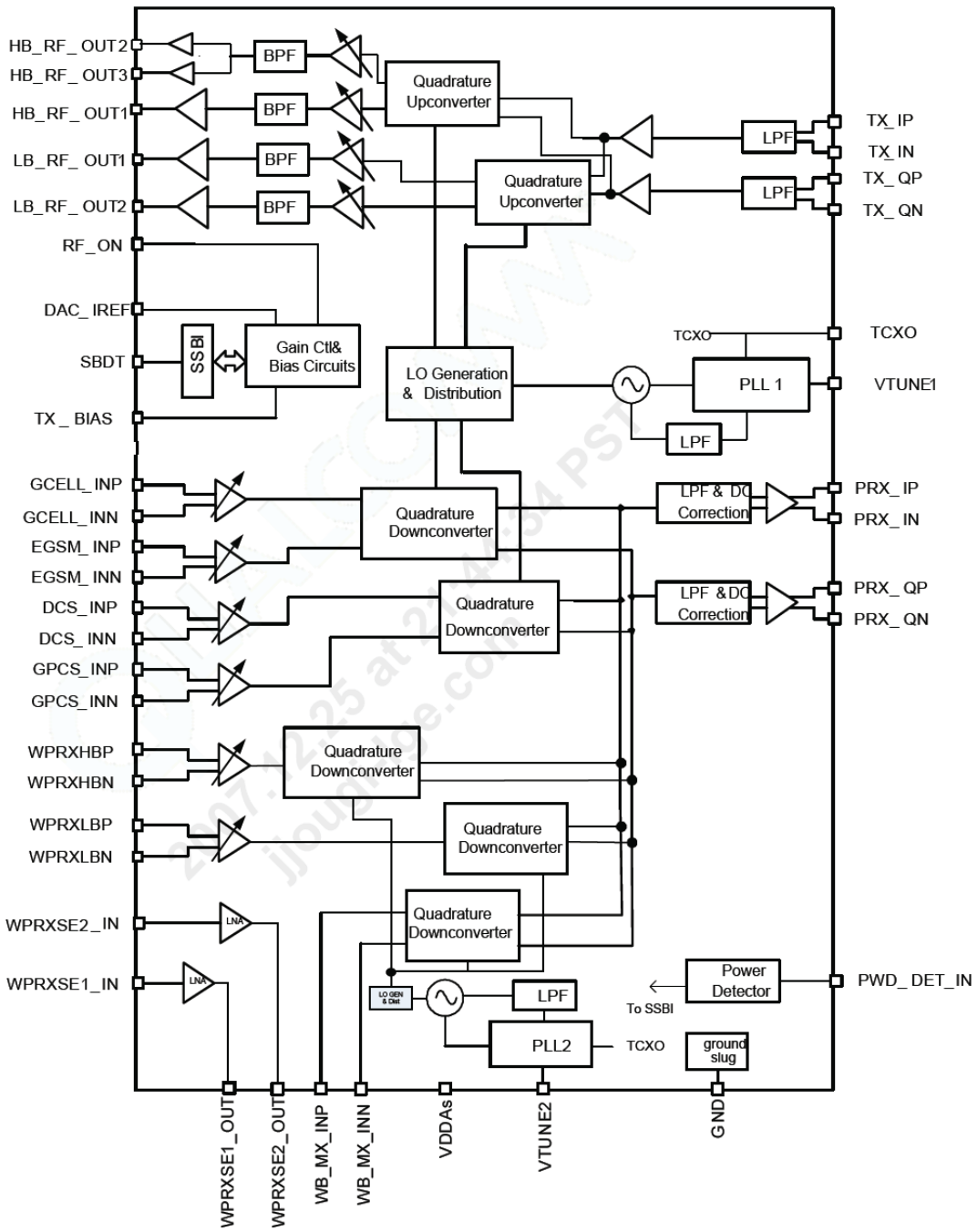
[Figure 1-4] UMTS Receiver Inputs Topologies

3.3.2 UMTS TRANSMITTER

The UMTS Tx path begins with differential baseband signals (I and Q) from the MSM device. These analog input signals are amplified, filtered, and applied to the quadrature up-converter mixers. The up-converter output is amplified by multiple variable gain stages that provide transmit AGC control. The AGC output is filtered and applied to the driver amplifier; this output stage includes an integrated matching inductor that simplifies the external matching network to a single series capacitor to achieve the desired 50-Ω interface.

The RTR6285 UMTS output is routed to its power amplifier through a bandpass filter, and delivers fairly high-level signals that are filtered and applied to the PA. Transmit power is delivered from the duplexer to the antenna through the switch module. The transceiver LO synthesizer is contained within the RTR6285 IC with the exception of the off-chip loop filter components and the VC-TCXO. This provides a simplified design for multimode applications. The PLL circuits include a reference divider, phase detector, charge pump, feedback divider, and digital logic generator.

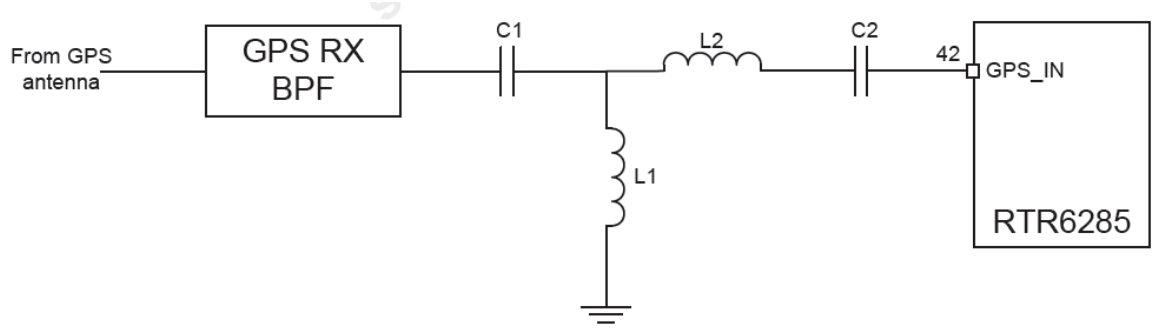
UMTS Tx. Using only PLL1, the LO generation and distribution circuits create the necessary LO signals for nine different frequency converters. The UMTS transmitter also employs the ZIF architecture to translate the signal directly from baseband to RF. This requires FLO to equal FRF, and the RTR6285 IC design achieves this without allowing FVCO to equal FRF. The RTR6285 IC is able to support UMTS 2100/1900/1800/1700 and 850 mode transmitting. This design guideline shows only UMTS 2100 applications.



[Figure 1-5] RTR6285 IC Functional Block Diagram

3.4 GPS RECEIVER

The GPS receiver input employs a single-ended connection realized by this pin. The GPS input is routed from the GPS antenna switch, through a band pass filter and then an impedance transformer circuit that optimally matches the impedance looking into the GPS LNA. The impedance transformer circuit topology is shown in Figure 1-6.



[Figure 1.6] GPS Input Network Topology

3.5 LO GENERATION and DISTRIBUTION CIRCUIT

The integrated LO generation and distribution circuits are driven by internal VCOs to support various modes to yield highly flexible quadrature LO outputs that drive all GSM/EDGE, UMTS band and GPS up-converters and down-converters; with the help of these LO generation and distribution circuits, true zero-IF architecture is employed in all GSM and UMTS band receivers and transmitters to translate the signal directly from RFto-baseband and from baseband-to-RF. Two fully functional fraction-N synthesizers, including VCOs and loop filters, are integrated within the RTR6285 IC. In addition, the RTR6285 has a third synthesizer used for GPS operation. The first synthesizer (PLL1) in the RTR6285 creates the transceiver Los that support the UMTS transmitter, and all four GSM band receivers and transmitters including: GSM850, GSM900, GSM1800, and GSM1900. The second synthesizer (PLL2) in the RTR6285 IC provides the LO for the UMTS primary receiver. For the RTR6285 IC only, the second synthesizer also provides the LO for the secondary UMTS receiver. The third synthesizer (PLL3), only in the RTR6285 IC, provides the LO for the GPS receiver. An external TCXO input signal is required to provide the synthesizer frequency reference to which the PLL is phase and frequency locked. The RTR6285 ICs integrate most of the PLL loop filter components on-chip except for three off-chip loop filter-series capacitors, which significantly reduces off-chip component requirement. With the integrated fractional-N PLL synthesizers, the RTR6285 ICs have the advantage of more flexible loop bandwidth control, fast lock time, and low-integrated phase error.

3.6 OFF-CHIP RF COMPONENTS

3.6.1. UMTS PAM

3.6.1.1 W2100,W900 (U1003, SKY77195)

The SKY77195 Power Amplifier Module (PAM) is a fully matched, 14-pad, surface mount module developed for Wideband Code Division Multiple Access (WCDMA) applications. This small and efficient module packs full WCDMA Band I and Band VIII coverage into a single compact package. The SKY77195 meets the stringent spectral linearity requirements of WCDMA transmission, with high power added efficiency for power output to 27.5 dBm (Band I) and 28 dBm (Band VIII). The SKY77195 meets the stringent spectral linearity requirements of High Speed Downlink Packet Access (HSDPA) data transmission with high power added efficiency. A directional coupler is integrated into the module thus eliminating the need for any external coupler.

The single Gallium Arsenide (GaAs) Microwave Monolithic Integrated Circuit (MMIC) contains all active circuitry in the module. The MMIC contains on-board bias circuitry, as well as input and interstage matching circuits. Output match into a 50-ohm load is realized off-chip within the module package to optimize efficiency and power performance.

The SKY77195 PAM is manufactured with Skyworks' InGaP GaAs Heterojunction Bipolar Transistor (HBT) BiFET process that provides for all positive voltage DC supply operation while maintaining high efficiency and good linearity. No VREF voltage is required. Power down is accomplished by setting the voltage on VENABLE to zero volts. No external supply side switch is needed as typical "off" leakage is a few microamperes with full primary voltage supplied from the battery.

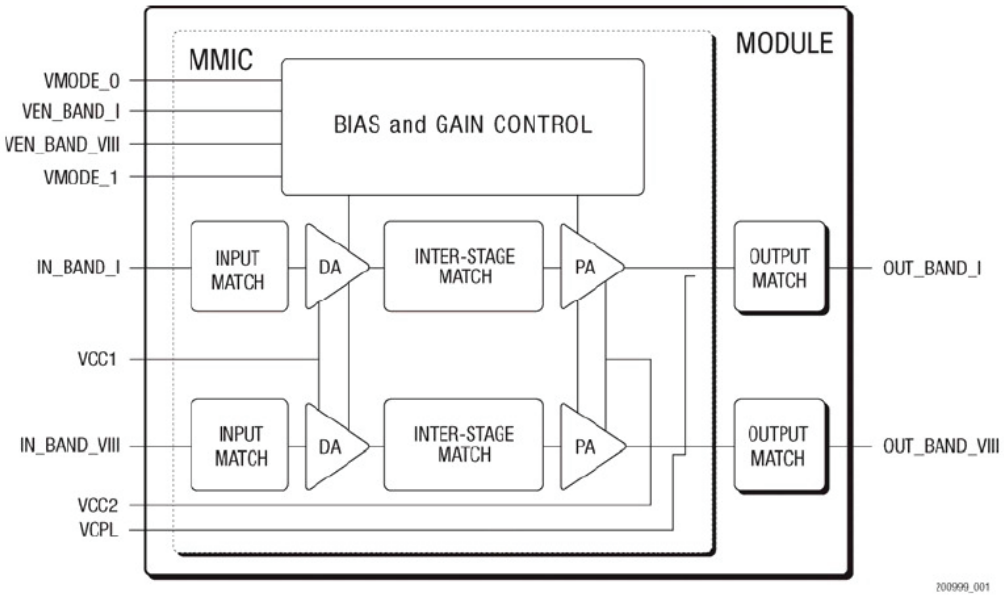


Figure 1. Functional Block Diagram

SKY77195 (W2100,W900)

3.6.2 19.2MHz VCTCXO (X250, KT3225L19200DCW28RA0)

The Voltage Controlled Temperature Compensated Crystal Oscillator (VCTCXO) provides the reference frequency for all RFIC synthesizers as well as clock generation functions within the MSM6285 IC. The oscillator frequency is controlled by the MSM6285 ICs.

TRK_LO_ADJ pulse density modulated signal in the same manner as the transmit gain control TX_AGC_ADJ. A two-pole RC lowpass filter is recommended on this control line.

The PM7540 IC controls the handset power-up sequence, including a special VCTCXO warm-up interval before other circuits are turned on. This warm-up interval (as well as other TCXO controller functions) is enabled by the MSM TCXO_EN line . The PM7540 IC VREG_TCXO regulated output voltage is used to power the VCTCXO and is enabled before most other regulated outputs. Any GSM mode power control circuits within the MSM7227 IC require a reference voltage for proper operation and sufficient accuracy. Connecting the PM7540 IC REF_OUT directly to the MSM7227 IC GSM_PA_PWR_CTL_REF provides this reference. This sensitive analog signal needs a 0.1 µF low frequency filter near to MSM side, and isolate from digital logic and clock traces with ground on both sides, plus ground above and below if routed on internal layers.

ELECTRICAL CHARACTERISTICS
(Ta=25+/-2deg.C, Vcc=2.8V+/-5%)

ITEMS	MIN.	TYP.	MAX.	UNIT	CONDITIONS	REMARKS
Nominal Frequency	---	19.200000	---	MHz	Vcc=2.8V+/-5%, Vcon=0.4 to 2.4V (2)	
Output Voltage(Peak to Peak)	0.8	---	---	V	Load:40pF/5kohm	Ta=-30 to +85deg.C, DC Bias
Power Supply Current (1)	---	---	1.6	mA		
Frequency Tolerance	-1.5	---	+1.5	ppm	Preset Frequency and after 2times reflow soldering	Ta=25+/-2deg.C, Vcon=1.4V
Frequency Stability (CTQ)	-2.0	---	+2.0	ppm	Ta=-30 to +85deg.C	ref.:Ta=25deg.C,
	-0.2	---	+0.2	ppm	Load:40pF+/-10%, 5kohm+/-10%	
	-0.2	---	+0.2	ppm	Voltage 2.8V+/-5%	
Frequency Stability Slope	-0.15	---	+0.15	ppm/deg.C	Ta=-10 to +60deg.C	
	-0.3	---	+0.3	ppm/deg.C	Ta=-30 to -10deg.C, +60 to +85deg.C	
Frequency Aging Rate	-0.7	---	+0.7	ppm/Y	Ta=25+/-2deg.C	One Year
Voltage Control Range	-12.0	---	-7.8	ppm	Vcon=0.4V	ref.:Vcon=1.4V
	7.8	---	12.0	ppm	Vcon=2.4V	
Start up Time	---	---	3.0	msec	90%*Vp-p	Ta=-30 to +85deg.C
	---	---	3.0		Within +/-0.5ppm	
Duty Cycle	40	---	60	%		
Harmonics	---	---	-5.0	dBc		Ta=-30 to +85deg.C
SSB Carrier Noise	---	---	-86	dBc/Hz	@10Hz offset	Ta=25+/-2deg.C
	---	---	-110	dBc/Hz	@100Hz offset	
	---	---	-130	dBc/Hz	@1kHz offset	
	---	---	-144	dBc/Hz	@10kHz offset	
	---	---	-144	dBc/Hz	@100kHz offset	

3.6.3 ASM + GSM PAM (U1002, SKY77544)

SKY77544 is a transmit and receive Front End Module (FEM) designed in a very low profile (0.9 mm), compact form factor for quad-band cellular handsets comprising GSM850/900, DCS1800, and PCS1900 operation — a complete transmit VCO-to-Antenna and Antenna-toreceive SAW filter solution. The FEM also supports Class 12 General Packet Radio Service (GPRS) multi-slot operation and EDGE Polar Modulation. WCDMA switch-through support is provided by three dedicated high-linearity ports.

The module consists of a GSM850/900 PA and DCS1800/PCS1900 PA block, impedancematching circuitry for 50 Ω input and output impedances, Tx harmonic filtering, high linearitylow insertion loss switches, and a CMOS Power Amplifier Control (PAC) block. A custom silicon integrated circuit contains decoder circuitry to control the RF switch while providing a low current external control interface. An integrated temperature sensor provides an analog voltage based on the temperature of the module.

Fabricated in InGaP/GaAs, the Heterojunction Bipolar Transistor (HBT) PA blocks support the GSM850/900 bands and DCS1800/PCS1900 bands. Both PA blocks share common power

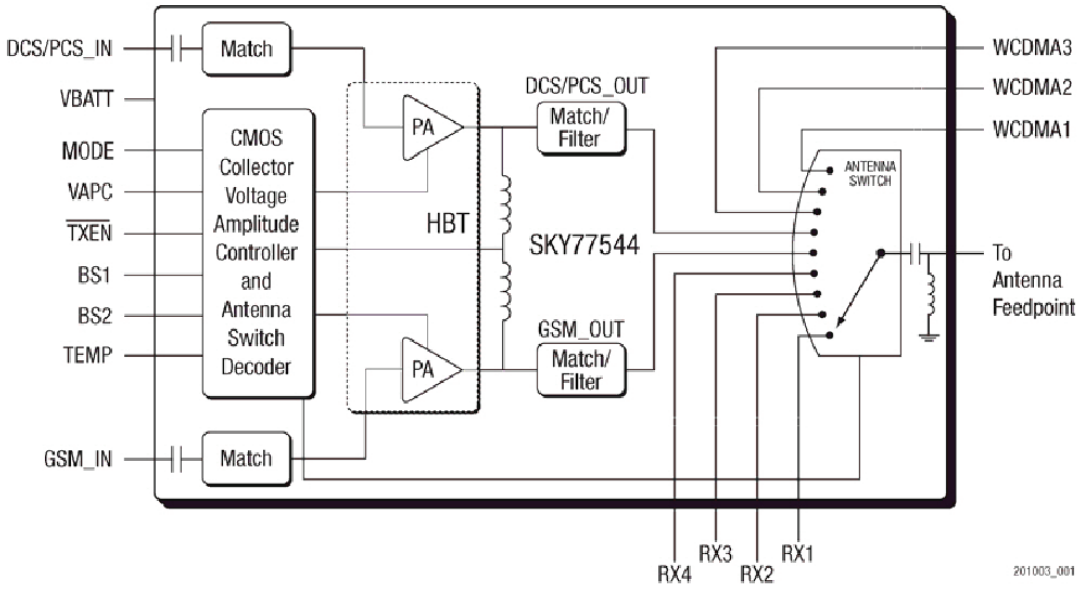
supply pads to distribute current. The output of the PA block and the outputs to the seven

receive pads connect to the antenna pad through a highly linear antenna switch. The WCDMA

and Rx ports feature a 0 volts DC offset level, which eliminates any need for external blocking capacitors. The InGaP/GaAs die, switch die, Silicon (Si) controller die, and passive components are mounted on a multi-layer laminate substrate and the entire assembly is encapsulated with plastic overmold.

RF input and output ports of the SKY77544 are internally matched to a 50 Ω load to reduce the number of external components for a quad-band design. Extremely low leakage current of the FEM maximizes handset standby time. Band selection and control of transmit and receive RF signal flows are performed by use of four external control pads. See Figure 1.9 shown on overleaf. Mode of operation Tx, Rx, Band (GSM850, GSM900, DCS, PCS, and UMTS) is controlled with 4 logic inputs: BS1, BS2, Mode, and TxEN. Proper timing of the TxEN input and the VAPC input ensures high isolation between the antenna and Tx-VCO while the VCO is being tuned prior to the transmit burst. The Enable input controls the initial turn-on of the PAC circuitry to minimize battery drain.

The integrated power amplifier control (PAC) function provides envelope amplitude control by reducing sensitivity to input drive, temperature, power supply, and process variation.



[Figure 1.9] SKY77544 Block Diagram

Mode	Input Control Bits			
	$\overline{\text{TxEN}}$	MODE	BS1	BS2
Standby	0	0	0	0
Tx_LOW BAND	0	0	0	1
Tx_HIGH BAND	0	0	1	1
TBD	0	1	0	1
TBD	0	1	1	1
Rx1	1	X	0	0
Rx2	1	X	0	1
Rx3	1	X	1	1
Rx4	1	X	1	0
WCDMA1	0	0	1	0
WCDMA2	0	1	0	0
WCDMA3	0	1	1	0

[Figure 1.10] SKY77544 Control Logic

3.6.4 GPS LNA (U1004, RF2815)

The RF2815 is a GPS Low Noise Amplifier with an integrated SAW filter at the output. Low noise figure, along with high gain, achieved by the RF2815 makes it ideal for GPS recievers requiring high sensitivity. This module builds upon RFMD's leading edge pHEMT process and integrates input matching and low loss high rejection SAW filter at the output. This results in high performance and a reduced solution size. The ease of implementation simplifies the reciever design.

The RF2185 is packaged in a compact 3.3 mm x 2.1 mm x 1.0 mm package with low external component count required to achieve the best-in-class performance.

3.7 Digital Baseband(DBB/MSM7227)

3.7.1 General Description

A. Features(MSM7227)

The basic MSM7227 system solution consists of the MSM7227, RTR6285™, and PM7540™ ICs, plus AMSS™ system software with the SURF7227™ platform available for development. General features include:

-WCDMA Rel '99 plus HSDPA and HSUPA

-GSM/GPRS/EDGE

-High-performance ARM1136JF-S™ application processor at up to 600 MHz; QDSP5000™ at 320 MHz

-High-performance ARM926EJ-S™ modem processor at up to 400 MHz; QDSP4000™ at 122.88 MHz

-Java® hardware acceleration for faster Java-based games and other applets

-Support for Bluetooth® 2.1 EDR via an external Bluetooth System-on-Chip (SoC)

-High-speed, serial mobile display digital interface (MDDI) that optimizes the interconnection cost between the MSM device and the LCD panel

-Receive diversity support for WCDMA mode, thereby providing improved capacity and data throughput

-USB 2.0 compliant high-speed USB core with limited OTG capabilities

-Integrated high-speed USB PHY

-Integrated wideband stereo codec for digital audio applications

-Direct interface to digital camera module with video front-end (VFE) image processing

-GPS position location capabilities

-Vocoder support (GSM-HR, FR, EFR, AMR, and AMR-WB/+)

-Advanced 12 × 12 ×1.05 mm, 0.4 mm pitch, 560 NSP

3.8 Hardware Architecture

<System HW Block>

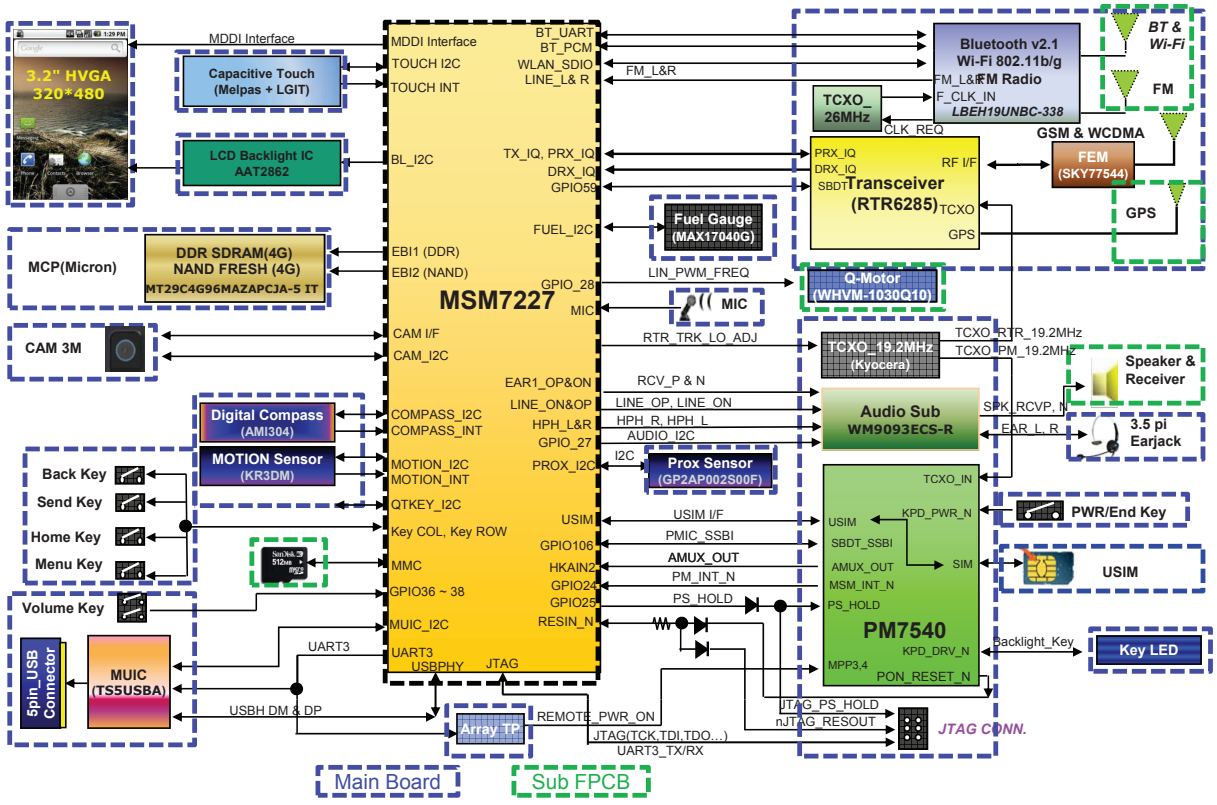


Figure. Block Diagram

<Power Block>

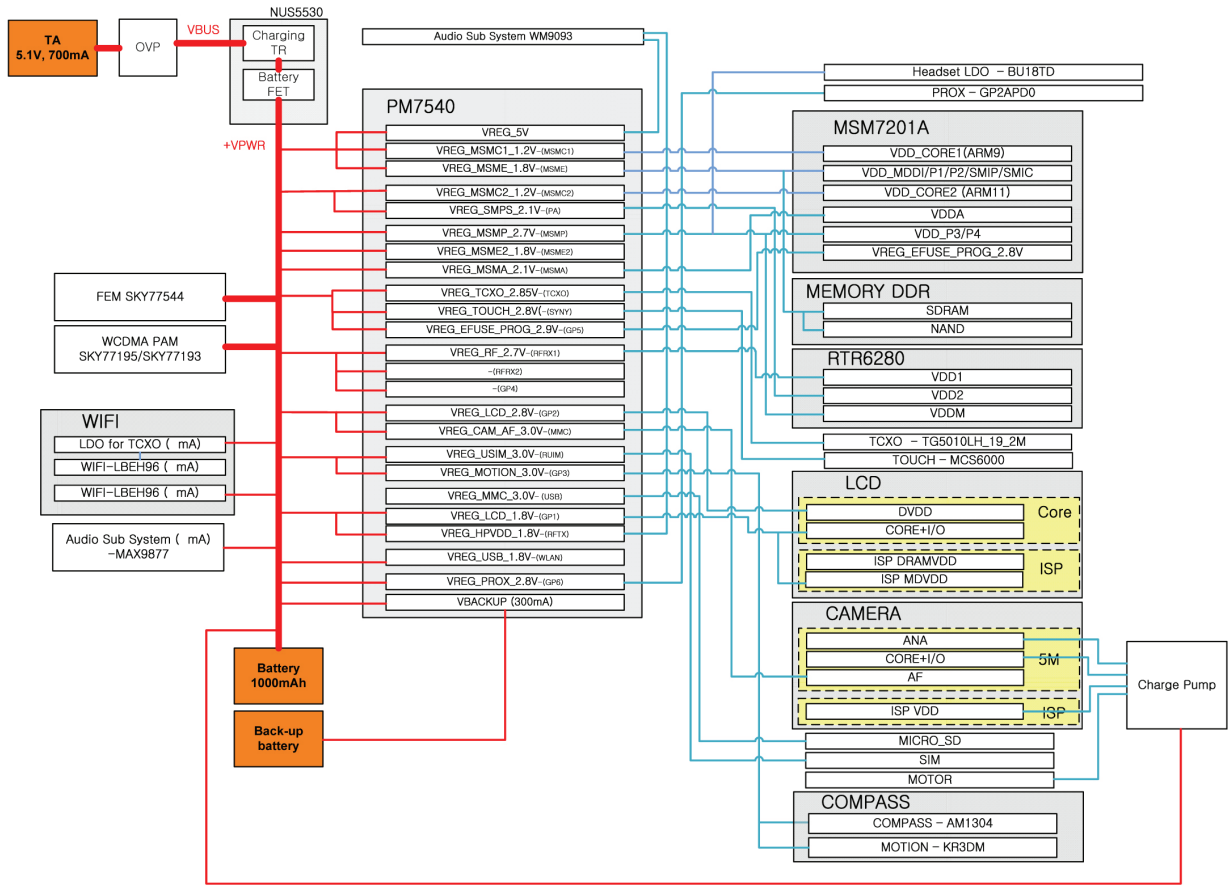


Figure. Simplified Block Diagram

3.9 Subsystem (MSM7227)

3.9.1. ARM Microprocessor Subsystem

The MSM7227 device uses an embedded ARM1136JF-S, ARM926EJ-S microprocessor. This microprocessor, through the system software, controls most of the functionality for the MSM, including control of the external peripherals such as the keypad, LCD, SDRAM, and NANDFlash devices. Through a QUALCOMM proprietary single-wire SBI (SSBI) the ARM926EJ-S configures and controls the functionality of the RTR6285 and PM7540 devices.

3.9.2. WCDMA Subsystem

The WCDMA subsystem performs the data conversions and signal processing necessary to maintain the WCDMA air interface between the handset and the base station (and also the WCDMA network). The subsystem components include:

-Searcher engine

-Demodulating fingers

-Combining block

-Frame deinterleaver

-Viterbi decoder

-Reverse link subsystem

-Turbo decoder

On the forward link traffic channel, the WCDMA subsystem searches, demodulates, and decodes incoming pilot, sync, paging, and traffic channel information. It extracts low bit-rate packet data from the forward link traffic channel and sends the packet data to the vocoder for processing. On the reverse link, the WCDMA subsystem processes the packet data from the vocoder and modulates the reverse traffic channel.

3.9.3. GSM Subsystem

The GSM subsystem performs the data conversions and signal processing necessary to maintain the GSM air interface, including PA gain control for GPRS support. For GSM, the power profile ramps up before the burst and ramps down afterward. For GPRS, transmit bursts can occur in as many as four sequential slots and the PA must be ramped up and down smoothly between each slot, holding the desired output power level during each burst. GSM support includes:

-GSM release '99 (circuit switching)

-GPRS (packet switching)

-EDGE E2 power class for 8 PSK

3.9.4. RF Interface

The RF interface communicates with the mobile station's external RF and analog baseband circuits. Signals to these circuits control signal gain in the Rx and Tx signal path and maintain The system's frequency reference.

3.9.5. Single-wire serial bus interface (SSBI)

The MSM7227 device's SSBI is designed specifically to be a quick, low pin count control protocol for QUALCOMM's RTR6285 and PM7540 ASICs. Using the SSBI, the RTR6285 and PM7540 devices can be configured for different operating modes and for minimum power consumption, extending battery life in Standby mode. The SBI also controls DC baseband offset errors.

3.9.6. Audio function

MSM7227 audio functions include the analog Rx and Tx paths (or stereo wideband codec), audio digital signal processing (DSP) that provides adjustable gains and filtering, PCM circuits for interfacing with external devices, and additional audio DSP that actually implements encoding and decoding. Other key features include:

-The wideband codec supports stereo music/ringer melody applications in addition to the 8 kHz voice band applications on the forward link.

-A PCM interface allows an external codec to be used instead of the internal codec; this supports inter-IC Sound (I2S) modes that allow an external stereo DAC or SADC to be used.

-Currently in AMSS baseline only I2S output mode is supported (SDAC-only, no SADC support).

-Audio decoder summing and headset switch detection are included.

-Audio DSP includes the Rx and Tx filters needed to meet ITU-T G.712 requirements.

-A programmable sidetone path provides for summing part of the Tx audio into the Rx path.

-Many codec parameters are configurable via SBI registers.

-The audio processing is configured through QDSP5 command types and is not directly controlled by the microprocessor.

3.9.7. Vocoder Subsystem

The MSM7227 device's QDSP4000 supports AMR,FR,EFR and HR. In addition, the QDSP4000 has modules to support the following audio functions: DTMF tone generation, DTMF tone detection, Tx/Rx volume controls, Tx/Rx automatic gain control (AGC), Rx Automatic Volume Control (AVC), EarSeal Echo Canceller (ESEC), Acoustic Echo Canceller (AEC), Noise Suppression (NS), and programmable, 13-tap, Type-I, FIR, Tx/Rx compensation filters. The MSM7227 device's integrated ARM9TDMI processor downloads the firmware into the QDSP4000 and configures QDSP4000 to support the desired functionality.

3.9.8. Mode Select and JTAG Interfaces

The mode pins to the MSM7227 device determine the overall operating mode of the ASIC. The options under the control of the mode inputs are Native mode, which is the normal subscriber unit operation, ETM mode, which enables the built-in trace mode, and test mode for factory testing. The MSM7227 device meets the intent of the ANSI/IEEE 1149.1A-1993 feature list. The JTAG interface can be used to test digital interconnects between devices within the mobile station during manufacture.

3.9.9. General-Purpose Input/Output Interface

The MSM7227 IC includes 133 general purpose input/output (GPIO) pins, and each can be configured as a digital input or digital output. Inputs can be set to have a pull-up, pull-down, keeper, or no-pull. Output drive strength is also programmable. Software assigns functions to the GPIOs and their configurations are set accordingly. Some of the GPIO pins have alternate functions supported on them. The alternate functions include USB interface, additional RAM, ROM, general-purpose chip selects, parallel LCD interface, and a UART interface. The function of these pins is documented in the various software releases.

3.9.10. UART

The MSM7227 device employs three UARTs. UART1 has dedicated pins while UART2 and UART3 share multiplexed pins.

-UART1 for Bluetooth

-UART2 for USIM interface

-UART3 for data

.

3.9.11. USB

The MSM7227 IC supports one High Speed USB (HS-USB) USBH port with built-in PHY and one Full Speed USB-UICC port. The MSM7227 IC supports USB interfaces using two controllers:

-The primary controller is the HS-USB port with an integrated physical layer (PHY). This HS-USB port is also capable of supporting USB operations at low-speed and full-speed.

-The secondary controller is the FS USB-UICC port, which only supports host mode functionality.

3.10 Power Block

3.10.1. General

MSM7227, included RF, is fully covered by PM7540 (Qualcomm PMIC). PM7540 cover the power of MSM7227, MSM memory, RF block, Bluetooth, USIM and TCXO.

Major power components are :

PM7540 (U403) : Phone main PMIC

3.10.2 PM7540

The PM7540 device (Figure) integrates all wireless handset power management. The power management portion accepts power from all the most common sources – battery, external charger, adapter, coin cell back-up – and generates all the regulated voltages needed to power the appropriate handset electronics. It monitors and controls the power sources, detecting which sources are applied, verifying that they are within acceptable operational limits, and coordinates battery and coin cell recharging while maintaining the handset electronics supply voltages. Eight programmable output voltages are generated using low dropout voltage regulators, all derived from a common trimmed voltage reference. A dedicated controller manages the TCXO warm-up and signal buffering, and key parameters (under-voltage lockout and crystal oscillator signal presence) are monitored to protect against detrimental conditions. MSM device controls and statuses the PM7540 IC using Single-wire SBI(SSBI) supplemented by an Interrupt Manager for time-critical information. Another dedicated IC Interface circuit monitors multiple trigger events and controls the power-on sequence.

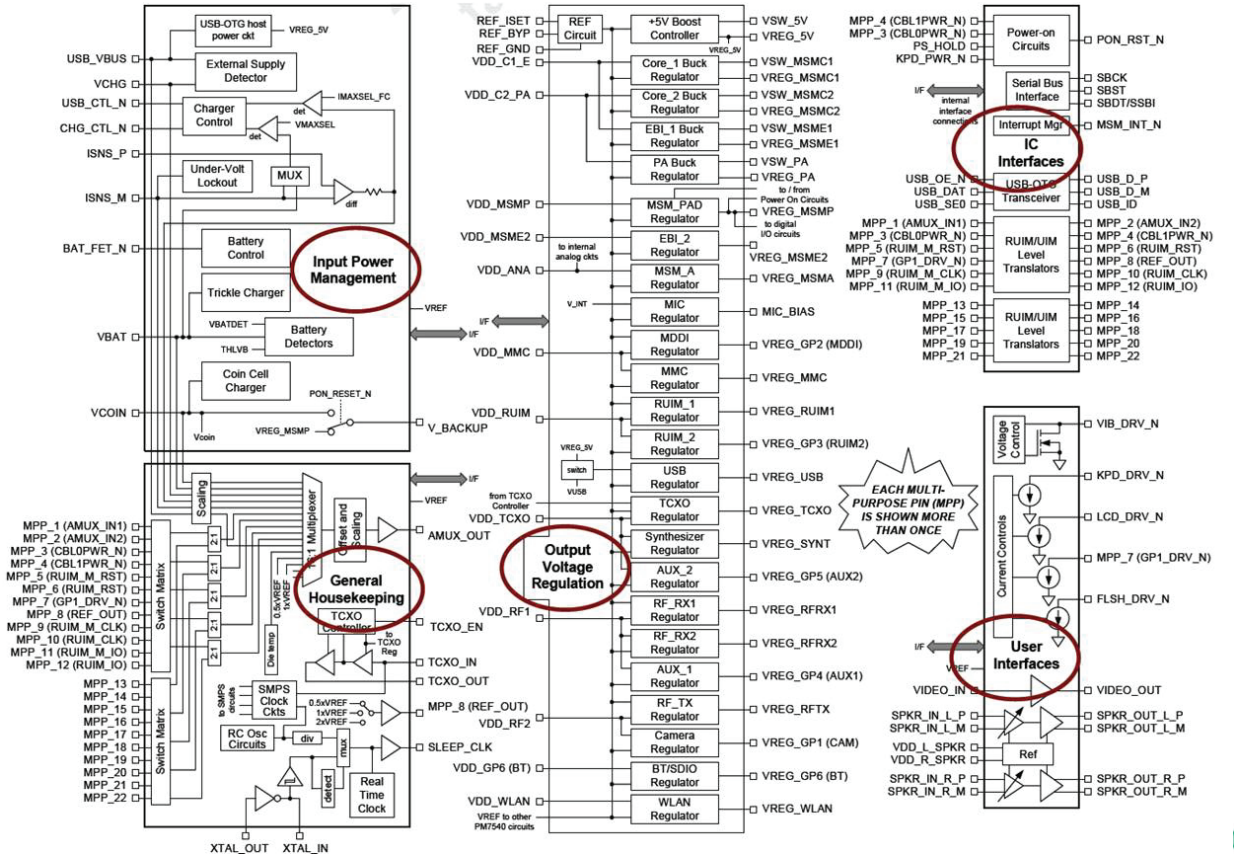


Figure. PM7540 functional block diagram

3.10.3. Charging control

A programmable charging block in PM7540 is used for battery charging. It is possible to set limits for the charging current. The external supply typically connects directly to pin (VCHG). The voltage on this pin (VCHG) is monitored by detection circuitry to ascertain whether a valid external supply is applied or not. For additional accuracy or to capture variations over time, this voltage is routed internally to the housekeeping ADC via the analog multiplexer. PM7540 circuits monitor voltages at VCHARGER and ICHARGE pins to determine which supply should be used and when to switch between the two supplies. These pins are connected to the Source (or emitter) and Drain (or collector) contacts of the pass transistor respectively.

3.10.3.1. Trickle Charging

Trickle Charging of the main battery, enabled through SBI control and powered from VDD, is provided by the PM7540 IC, The trickle charger is on-chip programmable current source that supplies current from VDD to pin (VBAT). Trickle charging can be used for lithium-ion and nickel-based batteries, with its performance specified below (3.2V). The charging current is set to 80mA.

Parameter	Min	Typ	Max	Unit
Trickle Current	60	80	100	mA

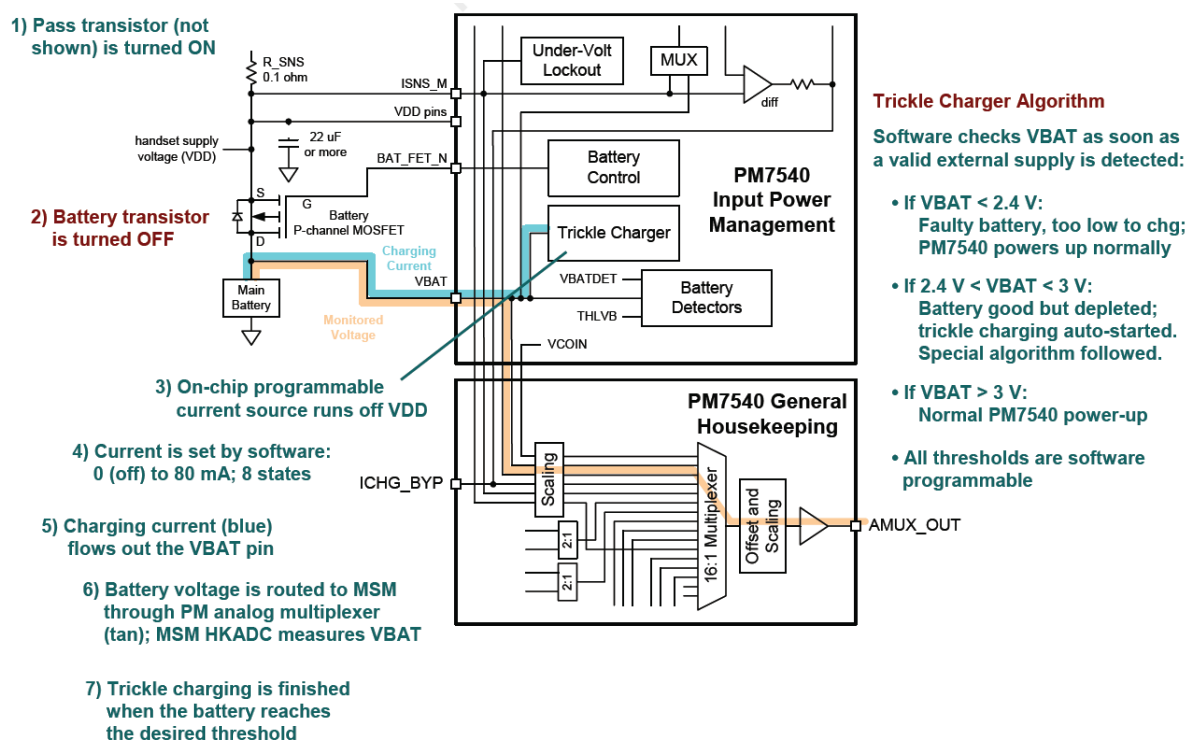


Figure. PM7540 Charging Flow (TC Charging)

3.10.3.2. Constant Current Charging

The PM7540 IC supports constant current charging of the main battery by controlling the charger pass transistor and the battery transistor. The constant current charging continues until the battery reaches its target voltage, 4.2V.

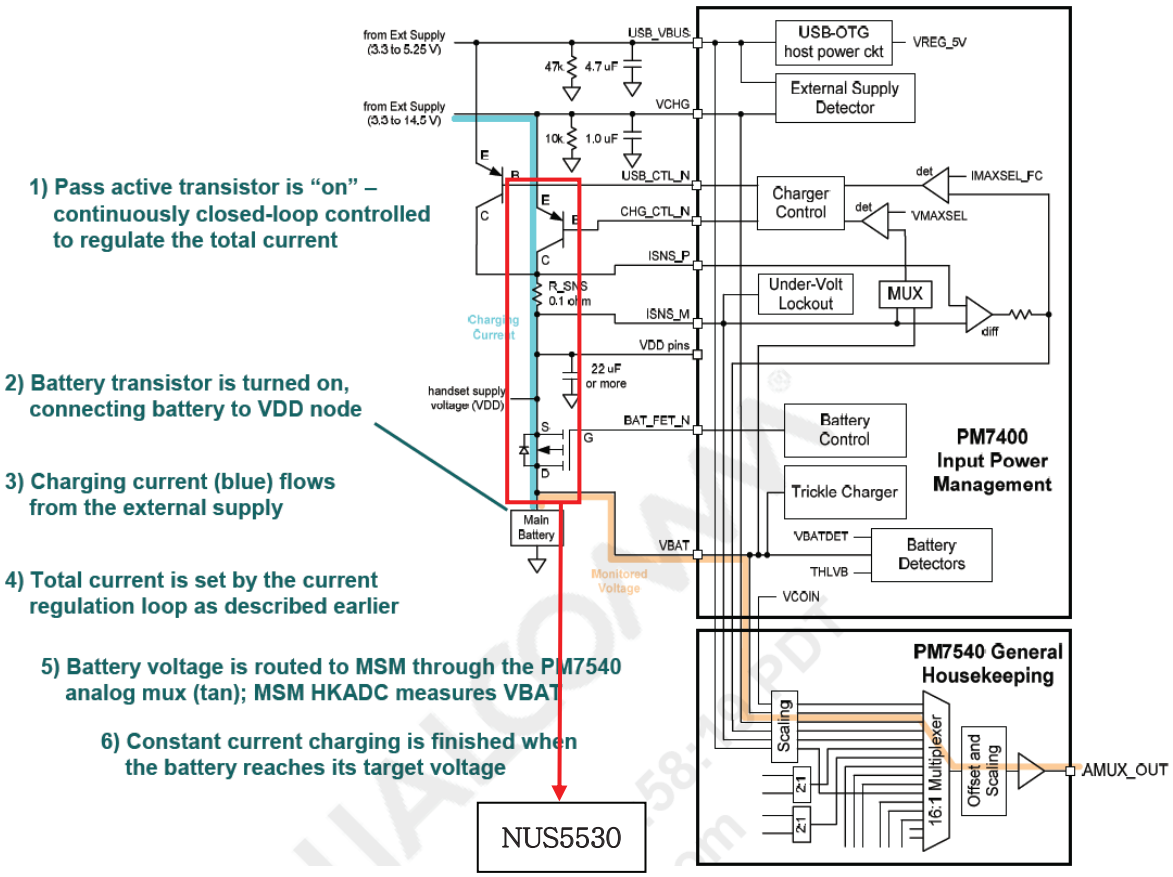


Figure. PM7540 Charging Flow (CC Charging)

3.10.3.3. Constant Voltage Charging

Constant voltage charging begins when the battery voltage reaches a target voltage, 4.2V. The end of constant voltage charging is commonly detected 10% of the full charging current.

3.10.3.4. LGP500 Charging Specification

-Charging Method : CC & CV (Constant Current & Constant Voltage)

-Maximum Charging Voltage : 4.2V

-Maximum Charging Current : 700mA

-Nominal Battery Capacity : 1500mAh

-Charging time : Max. 3h 30m

- Full charge indication current (icon stop current) : 50mA

3.10.3.5. LGP500 battery bar icon display

Battery Bar Number	Specification	
BAR 6 (Full)	90% over	Remain %
BAR 6 --> 5	90% → 89%	
BAR 5 --> 4	70% → 69%	
BAR 4 --> 3	50% → 49%	
BAR 3 --> 2	30% → 29%	
BAR 2 --> 1	15% → 14%	
BAR 1 --> 0	5% → 4%	
Low Battery Pop-up	4% ~ 15% : One Time popup (No call)	
Critical Low Battery Pop-up	0% ~ 3% : Level change마다 popup (No call)	
POWER OFF	0%	

Table. LGP500 battery bar specification

3.11 External memory interface

3.11.1. MSM7227

The MSM7227 device was designed to provide two distinct memory interfaces. EBI1 was targeted for supporting DDR synchronous memory devices. EBI2 was targeted towards supporting slower asynchronous devices such as LCD, NAND flash, SRAM, NOR flash etc. To support the high-bandwidth, high-density, and low-latency requirements of the advanced on-chip applications, the MSM7227 IC has two high-speed, high-performance memory slave interfaces: the external bus interface 1 (EBI1) and the stack memory interface (SMI). To achieve higher bandwidth and better use of the memory device interface, the SMI accepts multiple commands for the external memory

device. The SMI interface acts as a slave device to all of the bus masters within the MSM device. The masters arbitrate to gain access to the SMI, and upon obtaining the access, they issue commands to the SMI. The bus masters are connected to the SMI through an advanced extensible interface (AXI) bus bridge (or global interconnect block) and communicate over a 64-bit, non-blocking AXI bus protocol. The AXI bus bridge provides the arbitration logic for all of the bus masters.

EBI1 Features
- Support for only low-power memories at 1.8-V I/O power supply voltage
- AXI bus frequencies up to 133 MHz
- A 16-bit/32-bit static and dynamic memory interface

DDR SDRAM interface features include:
- Supports both 32-bit DDR SDRAM devices, up to 133-MHz bus speed
- Supports auto precharge and manual precharge
- Supports partial refresh
- Separate CKE pin per chip-select to support partial operation mode
- Idle power down to save idling power consumption

EBI2 Features
- Support for asynchronous FLASH and SRAM(16bit & 8bit).
- Interface support for byte addressable 16bit devices(UB_N & LB_N signals).
- 2Mbytes of memory per chip select.
- Support for 8 bit/16bit wide NAND flash.
- Support for parallel LCD interfaces, port mapped of memory mapped(8 or 16 bit)

3.11.2.LGP500 External memory Interface

-Multi Chip Package : DDR SDRAM and NAND Flash merged 1 package
-4Gbit Mobile DDR SDRAM / 4Gbit NAND Flash

Interface Spec				
Part Name	Product Gr	Maker	Operation Voltage	Speed
K524G2GACB-A050	NAND	SEC	1.8V	42ns
	SDRAM		1.8V	200MHz

3.12 H/W Sub System

3.12.1. RF Interface

3.12.1.1. RTR6285 (WCDMA_Tx, GSM_Tx/Rx)

MSM7227 controls RF part(RTR6285) using these signals.

-RTR6285_SSBI : SSBI I/F signals for control Sub-chipset
-RTR_TXON : Power AMP on RF part
-RTR_RX_I/Q_M/P, RTR_TX_I/Q_M/P : I/Q for T/Rx of RF
-RTR_DAC_REF : Reference input to the MSM Tx data DACs

3.12.1.2. the others

TRK_LO_ADJ : TCXO(19.2M) Control
PA_ON0/PA_RANGE0 : WCDMA(2100) TX Power Amp Enable
ANT_SEL[0-3] : Ant Switch Module Mode Selection(WCDMA,GSM Tx/Rx,DCS-PCS Tx/Rx)
GSM_PA_RAMP : Power Amp Gain Control of APC_IC

3.12.1.3. RF2815 (GPS LNA)

* GPS_LNA_EN : GPS LNA Enable Signal (GPS LNA Shutdown)

3.12.1.4. LBEH19UNBC-338 (BT / WiFi module)

WiFi

* WLAN_CMD : WLAN SDIO Command Line.
* WLAN_CLK : WLAN SDIO Clock Input.
* WLAN_SDIO[3:0] : WLAN SDIO Data Line.
* WLAN_RESET_N : Low asserting reset for WLAN core.
* WLAN_HOST_WAKEUP : WL_HOST_WAKEUP signal output.

BT

* BT_UART_RXD : Bluetooth UART Serial Input.
* BT_UART_RTS : Bluetooth UART Request to Send. Active-low request.
* BT_UART_CTS : Bluetooth UART Clear to Send. Active-low clear.
* BT_UART_TXD : Bluetooth UART Serial Output.
* BT_PCM_CLK : BT PCM clock, can be PCM-master (output) or PCM-slave (input).
* BT_PCM_DIN : BT PCM data input.
* BT_PCM_SYNC : BT PCM sync signal, can be PCM-master (output) or PCM-slave (input).
* BT_PCM_OUT : BT PCM data output.
* BT_WAKEUP : BT Wakeup Input.
* BT_HOST_WAKEUP : BT Host Wakeup Output
* BT_RESET_N : Low asserting reset for BT core.

Common

* WLAN_REG_ON : If low the internal regulators will be disabled.
* SLEEP_CLK : LPO clock (32.768kHz) input. Used for low-power mode timing.
* CLK_IN : Crystal amplifier input or frequency reference input.
* CLK_REQ : Crystal Circuit / Reference Clock Enable (active-high)

FM Radio

* FM_ANT : FM RF input.
* SLEEP CLK : External reference oscillator input. (32.768KHz)
* FM_R : Right audio line output – digital input data.
* FM_L : Left audio line output – digital frame synchronization.

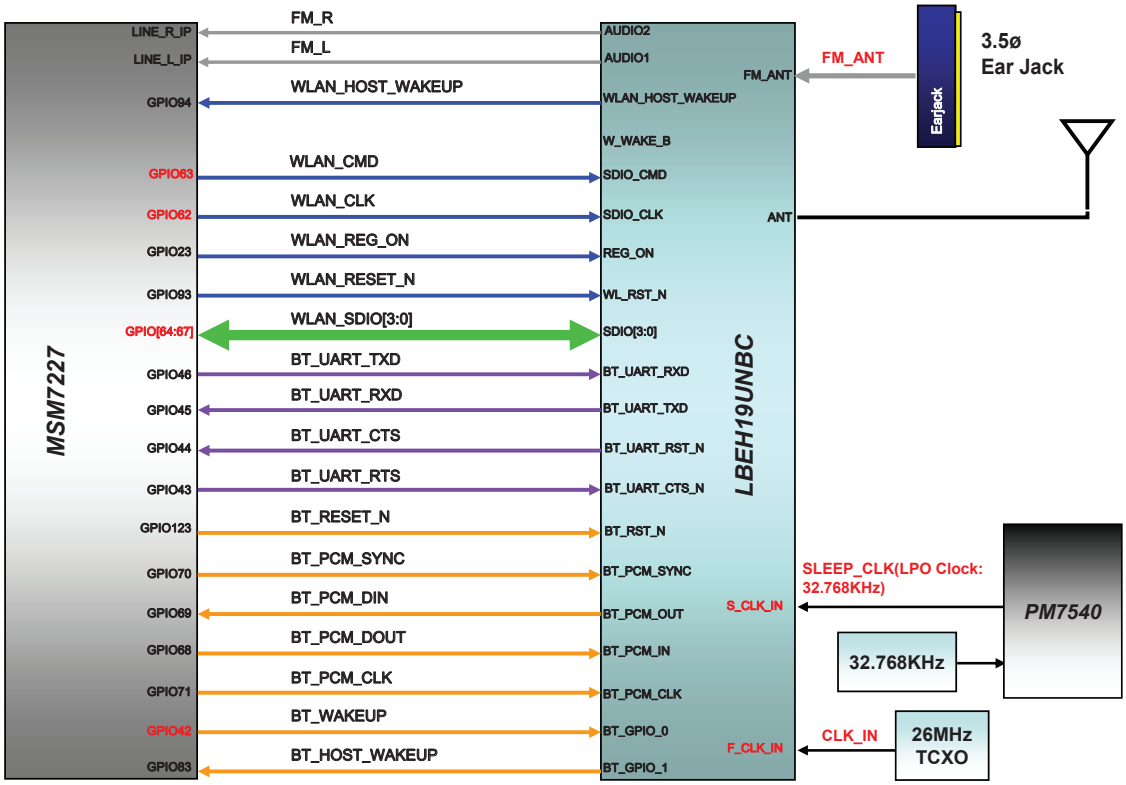


Figure. Wifi/BT/FM Interface Block Diagram

3.12.2 MSM Sub System

3.12.2.1. USIM Interface

SIM interface scheme is shown in Figure.

And, there control signals are followed

-USIM_CLK : USIM Clock
-USIM_Reset : USIM Reset
-USIM_Data : USIM Data T/Rx

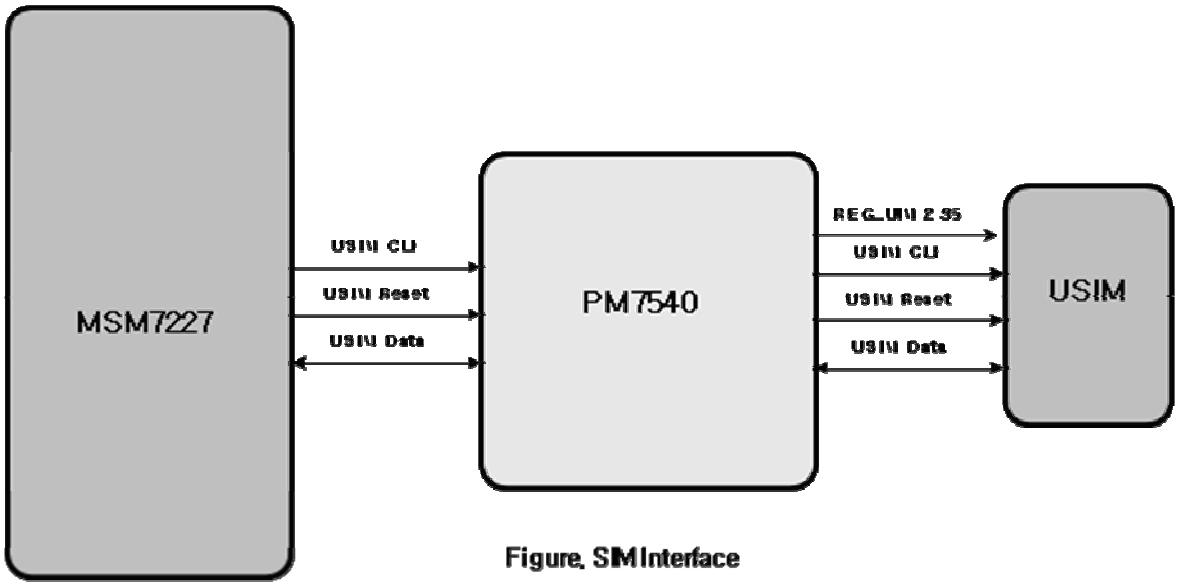


Figure. SIM Interface

3.12.2.2. UART Interface

UART signals are connected to MSM GPIO through IO connector with 115200 bps speed.

GPIO_Map	Name	Note
GPIO_86	UART3_RX	Data_Rx
GPIO_87	UART3_TX	Data_Tx

Table. UART Interface

3.12.2.3. HS-USB

The High-Speed USB module contains an embedded UTMI+ core with a built-in transceiver eliminating the need for an external PHY. The HS-USB port is a standard 4-pin interface that connects directly to the USB connector (USBPHY_DP, USBPHY_DN, USBPHY_ID and USBPHY_VBUS). Two additional pins are required for PHY operations which include an external reference resistor pin (USBPHY_REXT) and a USB system clock pin which the USB PHY uses to lock its internal PLL (SYS_CLK)

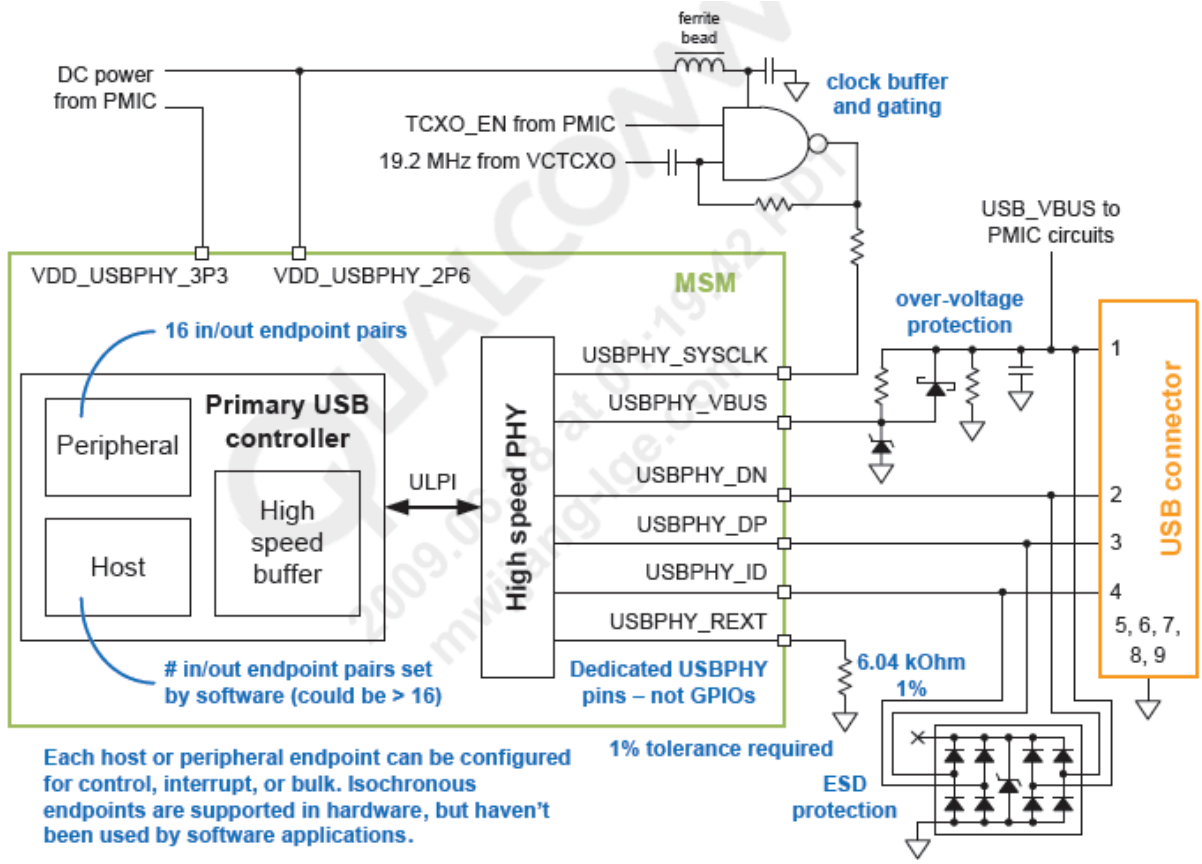


Figure. HS-USB connections and architecture

3.12.3 KEY

3.12.3.1 Side key

There are 3 side key buttons that are controlled by MSM7227.

Refer to the circuit.

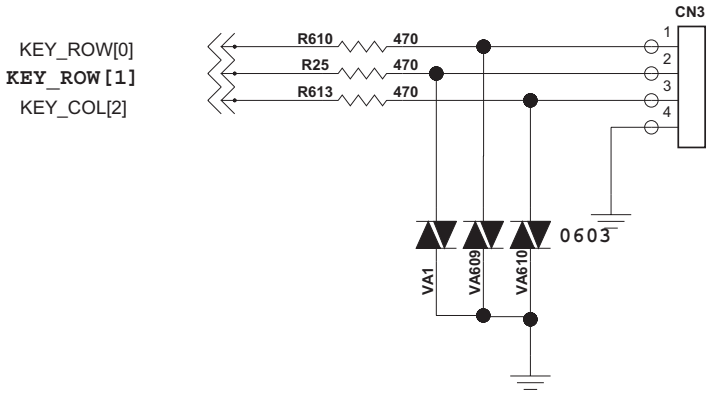


Figure. Volume Side key

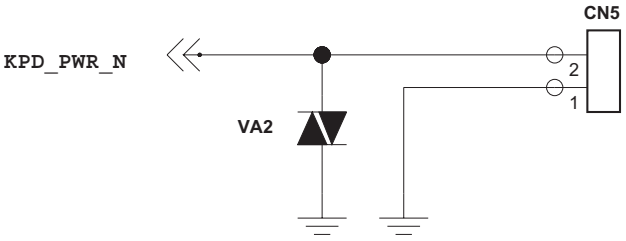


Figure. Power key

3.12.3.3 KEY Backlight

There are 4 White side view LED, 4 white LED in key backlight circuit

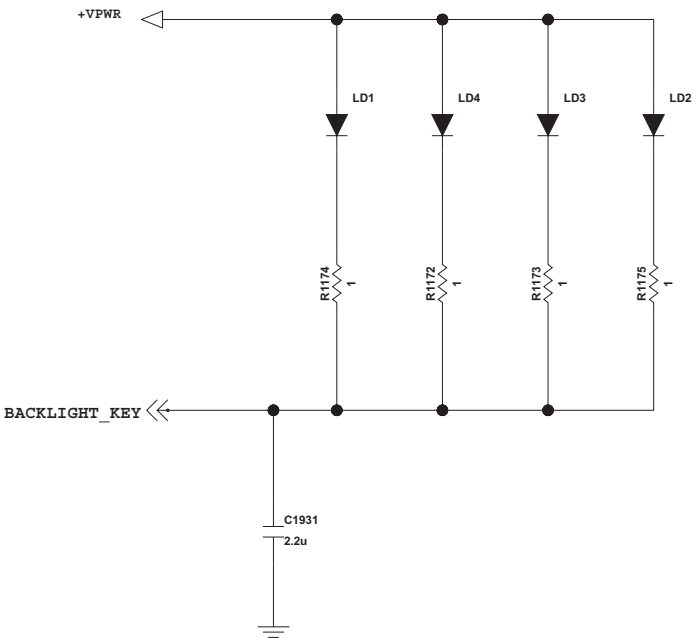


Figure. KEY Backlight

3.13. Audio and sound

3.13.1. Overview of Audio path

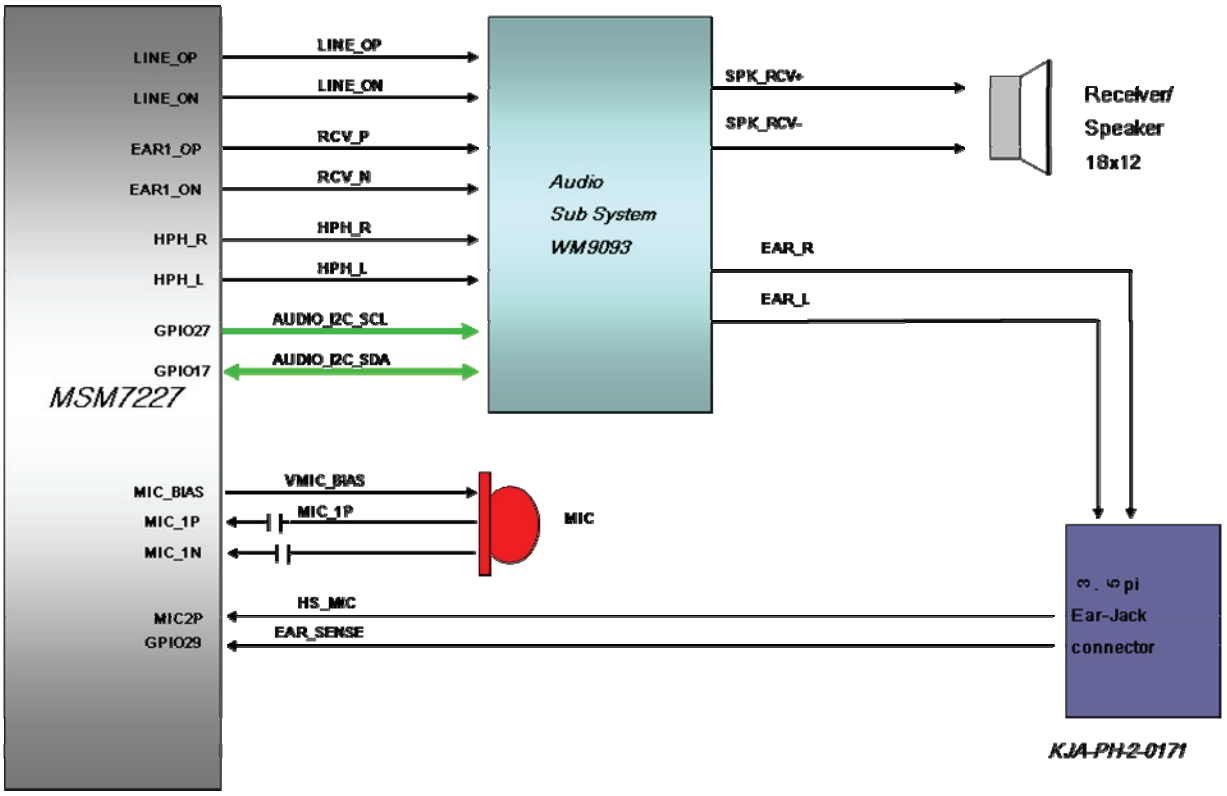


Figure. Block diagram of Audio & Sound path

3.13.2. Audio signal processing & interface

3.13.2.1 MSM7227 audio interface

The MSM7227A audio front end comprises the stereo wideband codec, PCM interface, and additional DSP audio processing. The stereo wideband codec allows the MSM7227 device to support stereo music/ringer melody applications in addition to the 8 kHz voice band applications on the forward link.

In the audio transmit path, the device operates as 13-bit linear converter with software, selectable 8 kHz and 16 kHz sampling rate. In the audio receive path, the device operates as a software-selectable 13-bit or 16-bit linear converter with software selectable 8 kHz,16 kHz, 22.05 kHz, 24 kHz, 32 kHz, 44.1 kHz, or 48 kHz sampling rate. Through software, the Rx path can be configured as either a mono or stereo output. New to the MSM7227 device is a transmit (Tx) ADC path that now supports stereo wideband sampling. The integrated codec contains all of the required conversion and amplification stages for the audio front end. The codec operates as a 13-bit linear codec with the transmit (Tx) and receive (Rx) filters designed to meet ITU-T G.712 requirements.

The codec includes a programmable side tone path for summing a portion of the Tx audio into the Rx path. An on-chip voltage/current reference is provided to generate the precise voltages and currents required by the codec. This circuit requires a single capacitor of 0.1 µF to be connected between the CCOMP and GND pins. The on-chip voltage reference also provides a microphone bias voltage required for electret condenser microphones typically used in handset applications. The MICBIAS output pin is designed to provide 1.8 V DC while delivering as much as 1 mA of current.

Audio decoder summing and headset switch detection are included. The codec interface includes the amplification stages for both the microphone and earphone. On the transmit (Tx) path, the interface supports two differential microphone inputs, a differential auxiliary input, and a stereo line input. On the receive (Rx) path the interface supports one differential earphone output, a stereo single-ended headphone output, one differential auxiliary output, and stereo single-ended line outputs. The codec is configured by the codec SBI registers. The codec interface is shown in Figure.

Also part of the audio front end is the PCM interface. The PCM interface allows for an external codec to be used instead of the internal codec. This interface can be used in I2S mode which will allows for an external stereo DAC to be used. Finally, the audio front end includes additional DSP audio processing that does gains, filtering and other audio processing.

The DSP audio processing is configured through the QDSP5000 command types and is

not directly controlled by the microprocessor.

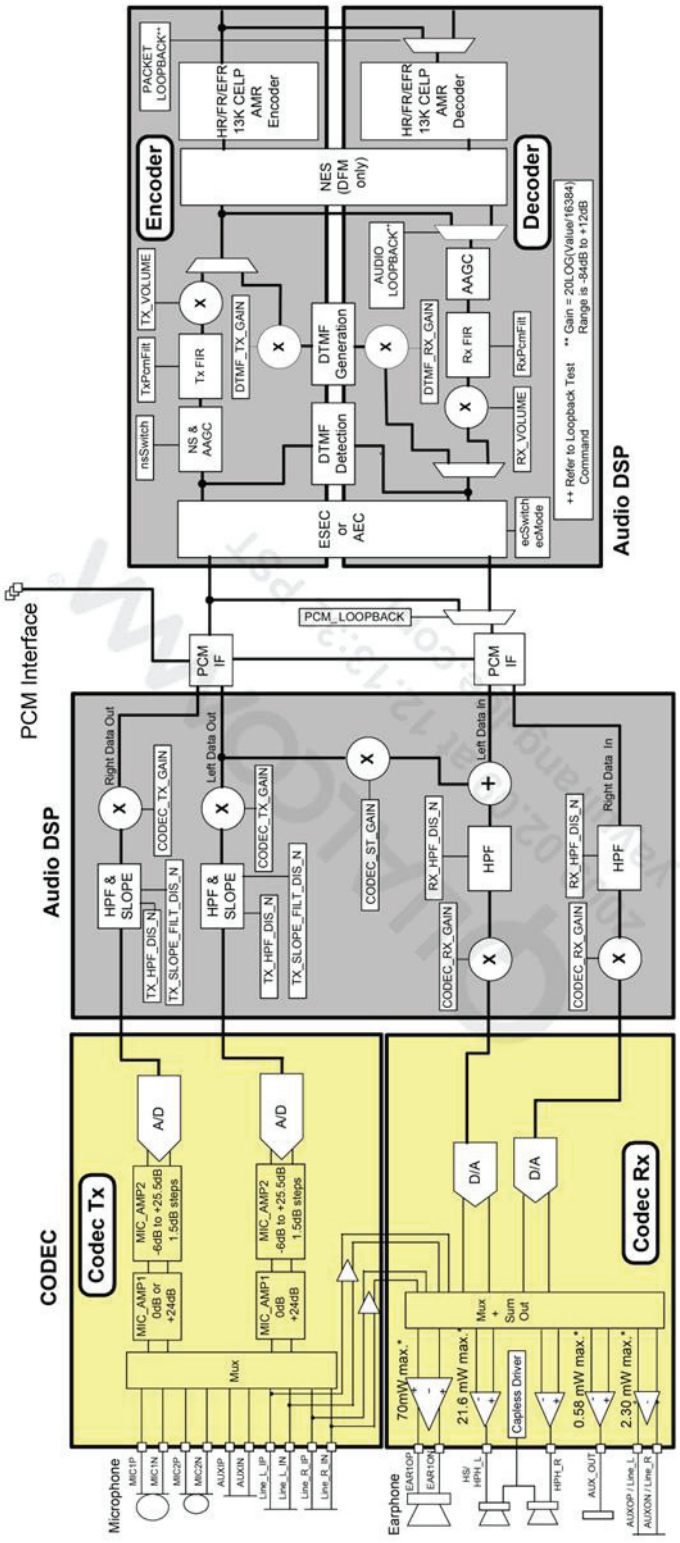


Figure. Detailed diagram of MSM7227 audio interface

3.13.2.2 WM9093 audio interface

The WM9093 is a high performance low power audio subsystem, including headphone driver and Class AB/D earpiece/speaker driver. The Class D speaker driver support 650mV output power at 3.6V, 1%THD.

The unique dual mode charge pump architecture provides ground referenced headphone outputs removing the requirement for external coupling capacitors. Class G technology is integrated to increase the efficiency and extend playback time by optimizing the headphone driver supply voltages according to the volume control.

The flexible input configuration allows single ended or differential stereo inputs. Mixers allow highly flexible routing to the outputs, A 'voice Bypass' path is also available for low-power voice applications.

The WM9093 is controlled using a two-wire I2C interface. An integrated oscillator generates all internal clocks. Removing the need to provide any external clock.

Separate mixer and volume controls are provided for each headphone and speaker driver. Automatic Gain control limits the speaker output signal in order to prevent clipping. DC offset correction to less than 1mV Guarantees a pop/click-free headphone start up.

The WM9093 is available in a 2.0mm × 2.5mm 20-bump CSP package.

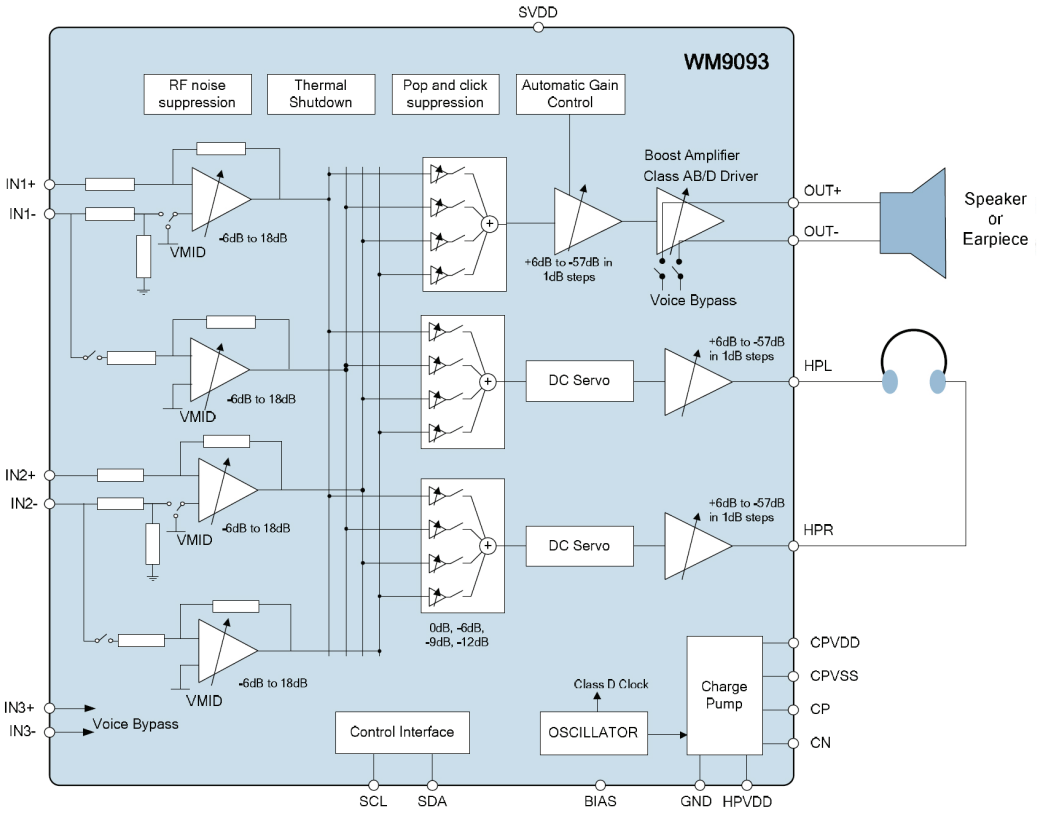
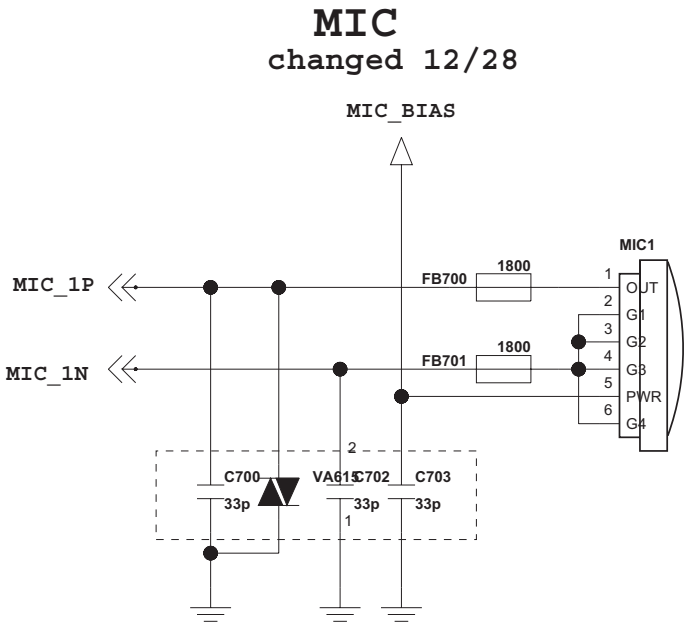
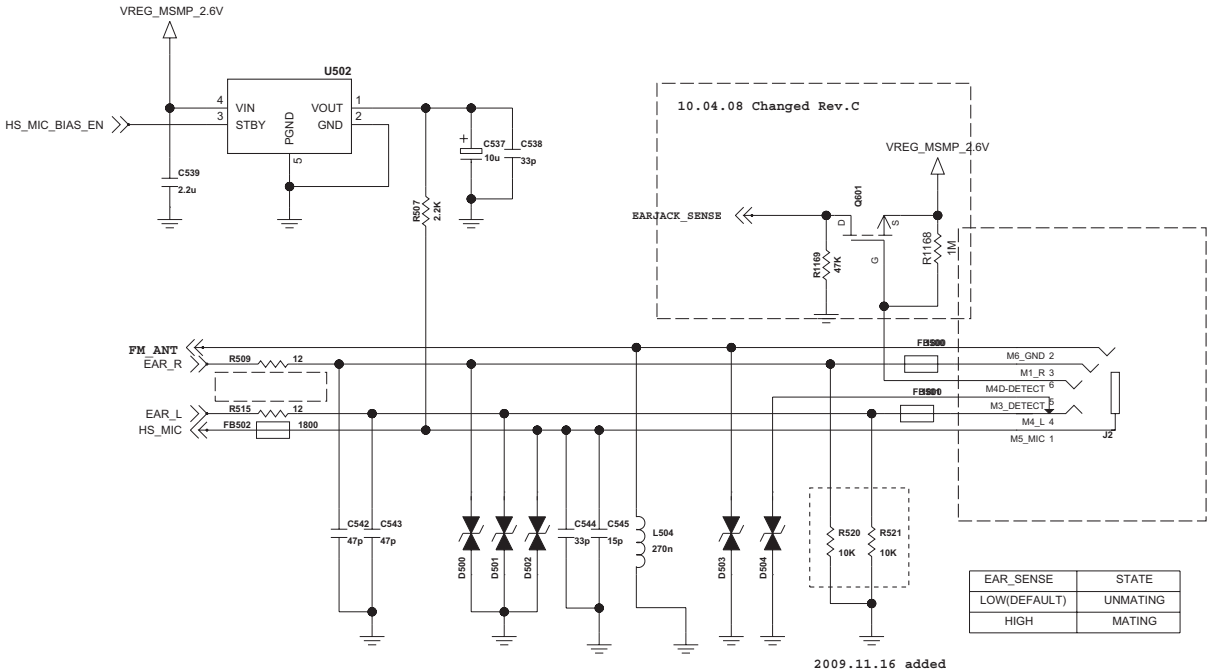


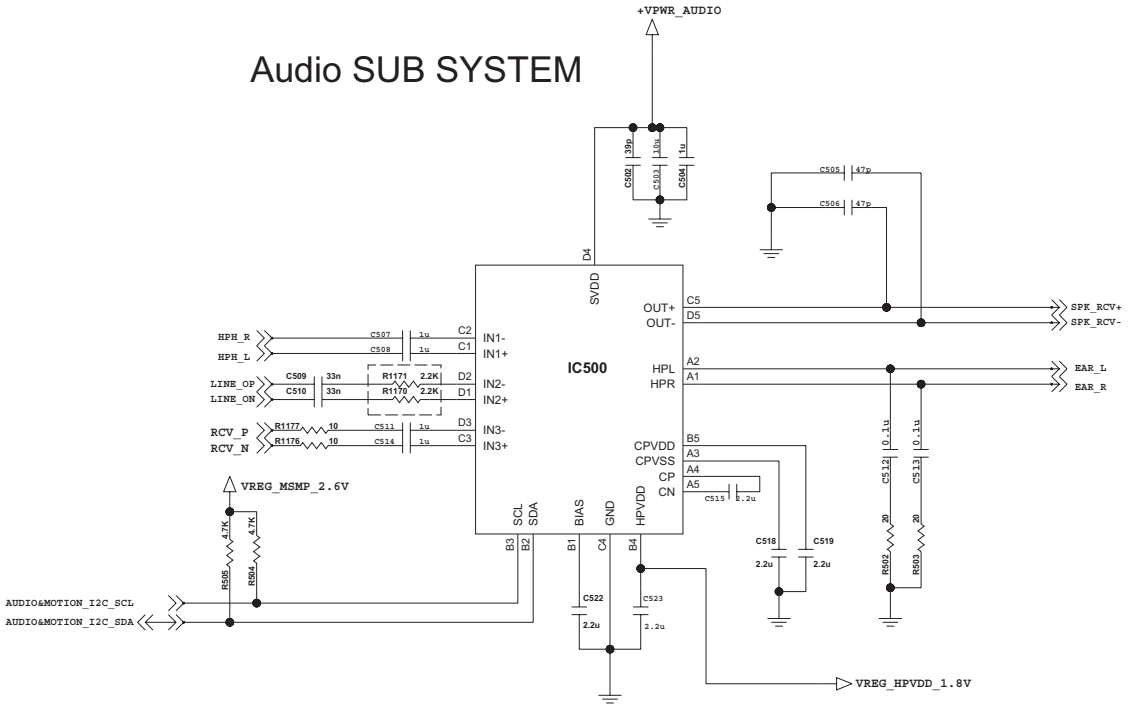
Figure. Detailed diagram of WM9093 audio interface



3.5pi Ear Jack Connector



EAR_SENSE	STATE
LOW(DEFAULT)	UNMATING
HIGH	MATING



3.14 Display

LCD module is connected to Main PCB with 24-pin connector.

The LCD is controlled by MDDI Interface in MSM7227.

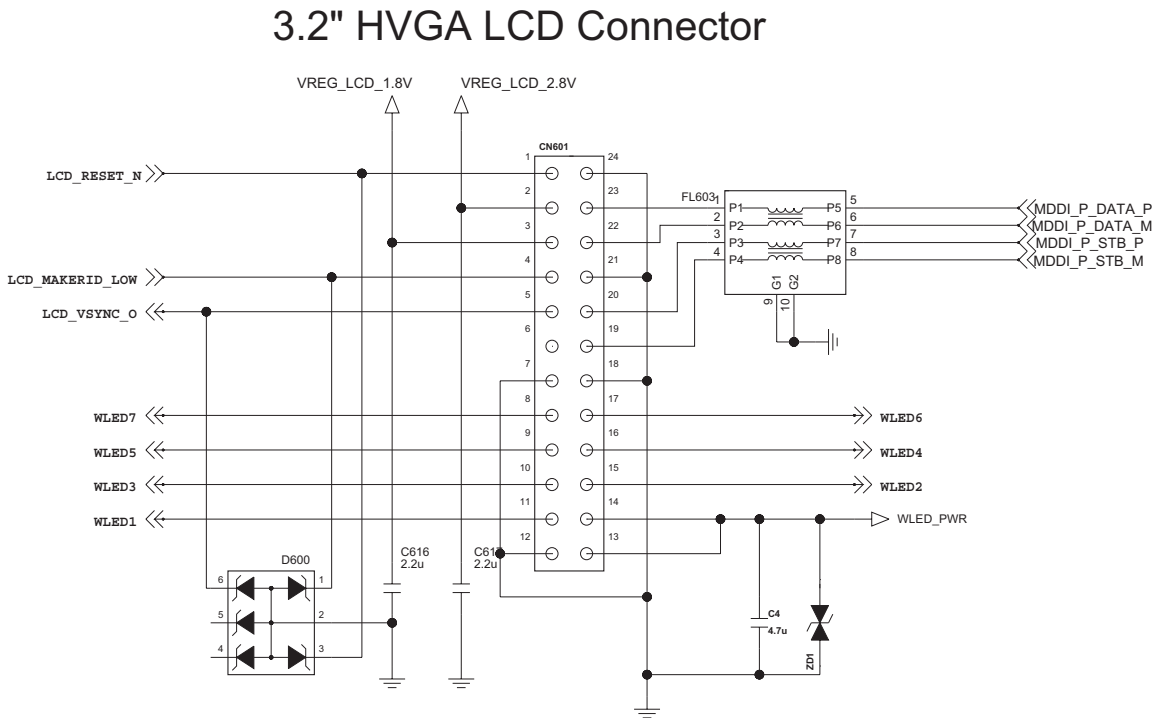


Figure. Schematic of LCD connector (Main Board)

Pin No.	Signal	I/O	Function	Driver's Signal Name
1	RESX	I	Reset	RESX
2	VCI	-	Power Supply for Analog and Voltage booster block	VCI
3	VDD3	-	Power Supply for Interface I/O	VDD3
4	MAKERID(Low)	O	Maker ID (Low : GND level)	-
5	TE	O	Tearing Effect Signal	TE
6	BC	O	Back Light Control of LED Driver	BC
7	GND	-	Ground	-
8	LED7 - Cathode	-	Ground for LED	-
9	LED5 - Cathode	-	Ground for LED	-
10	LED3 - Cathode	-	Ground for LED	-
11	LED1 - Cathode	-	Ground for LED	-
12	GND	-	Ground	-
13	LED - Anode	-	Power Supply for LED	-
14	LED - Anode	-	Power Supply for LED	-
15	LED2 - Cathode	-	Ground for LED	-
16	LED4 - Cathode	-	Ground for LED	-
17	LED6 - Cathode	-	Ground for LED	-
18	GND	-	Ground	-
19	MSN	I	MDDI strobe negative signal	MSN
20	MSP	I	MDDI strobe positive signal	MSP
21	GND	-	Ground	-
22	MDN	I/O	MDDI data negative signal	MDN
23	MDP	I/O	MDDI data positive signal	MDP
24	GND	-	Ground	-

Table. Interface between LCD Module and MAIN Board

3.15 Proximity Sensor

When call connected, the object is moved nearer to the proximity sensor.

LCD backlight and Touch screen is disable operation automatically.

U700 : GP2AP002S00F IC used I2C interface to MSM7227

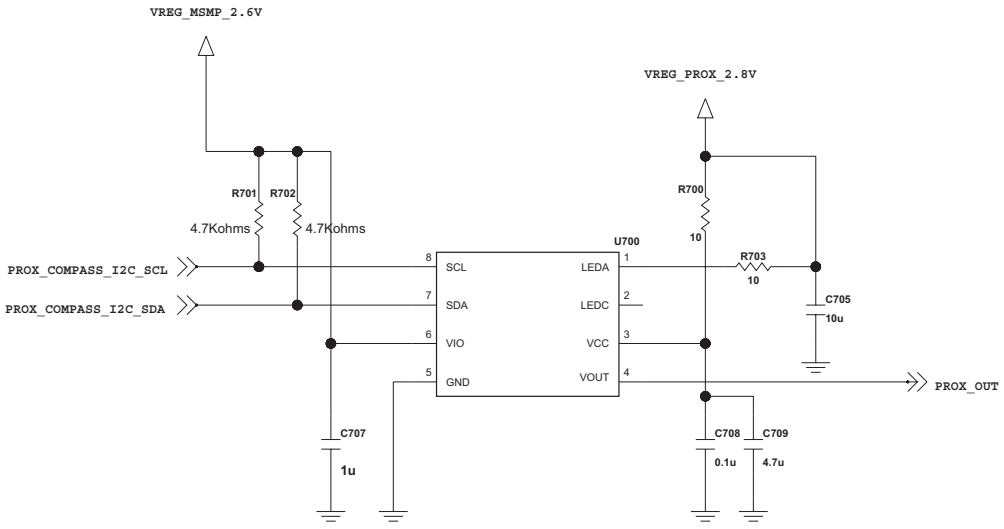
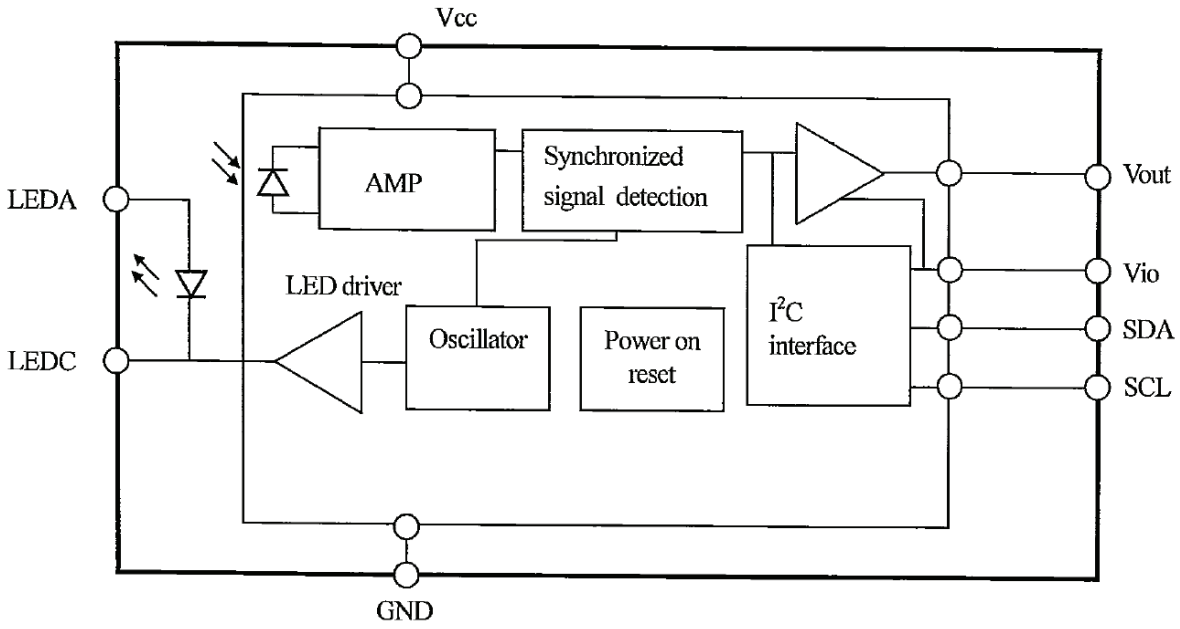


Figure. Proximity Sensor Schematic



3.16 Vibrators (Q-Coin Motor)

The strength of vibration is determined by the duty cycle of PWM (LIN_PWM_FREQ)

U602 : EUSY0404001 is Q-Coin motor driver IC.

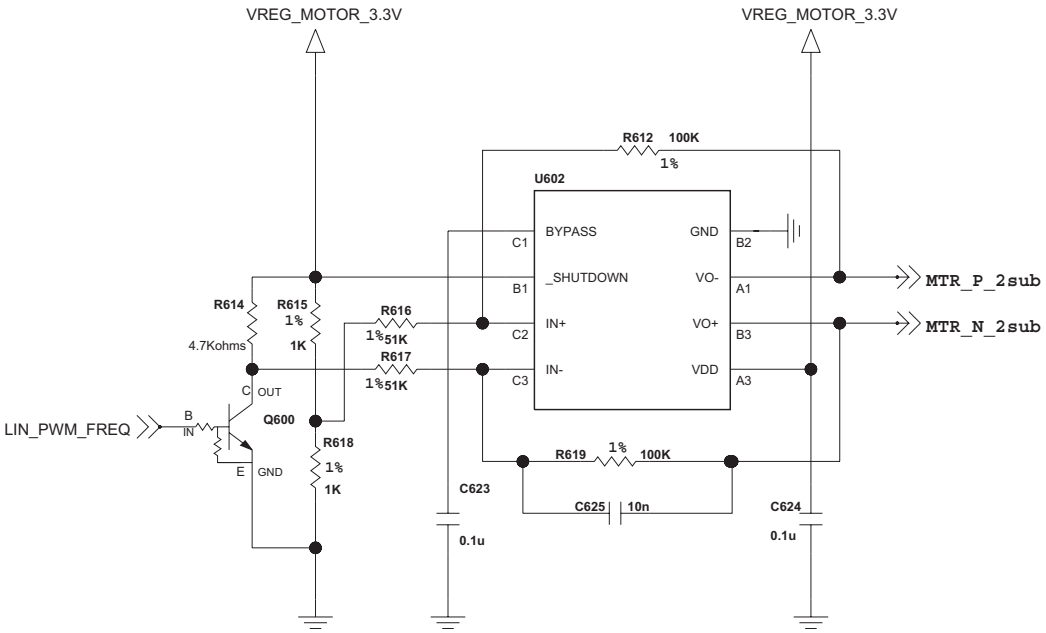


Figure. Q-Coin Moter IC Schematic

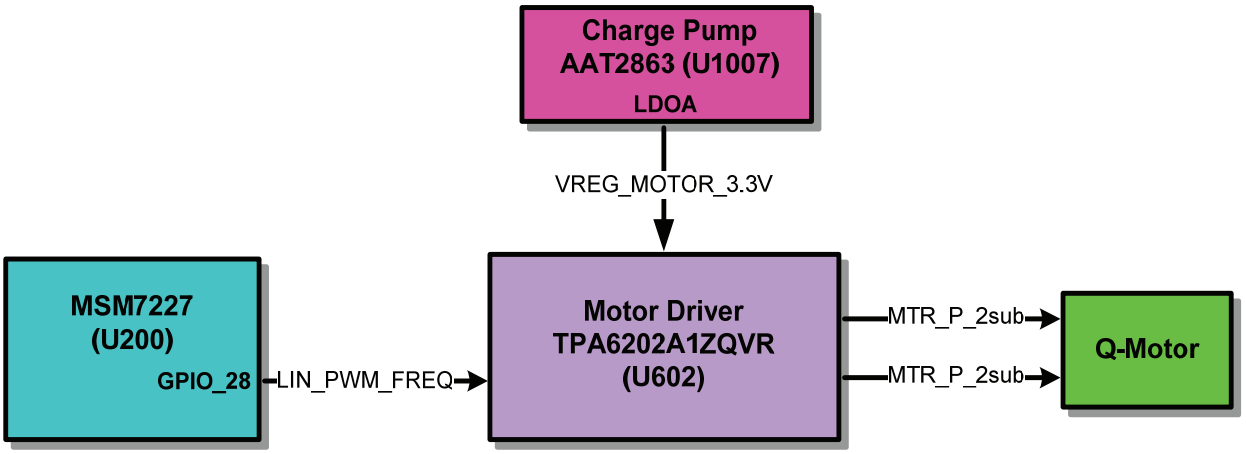


Figure. Vibrator Block Diagram

3.17 Compass Sensor

If a customer buy the application SW, The Sensor Support a Eletric Compass function

U1 : AMI304 IC used I2C interface to MSM7227

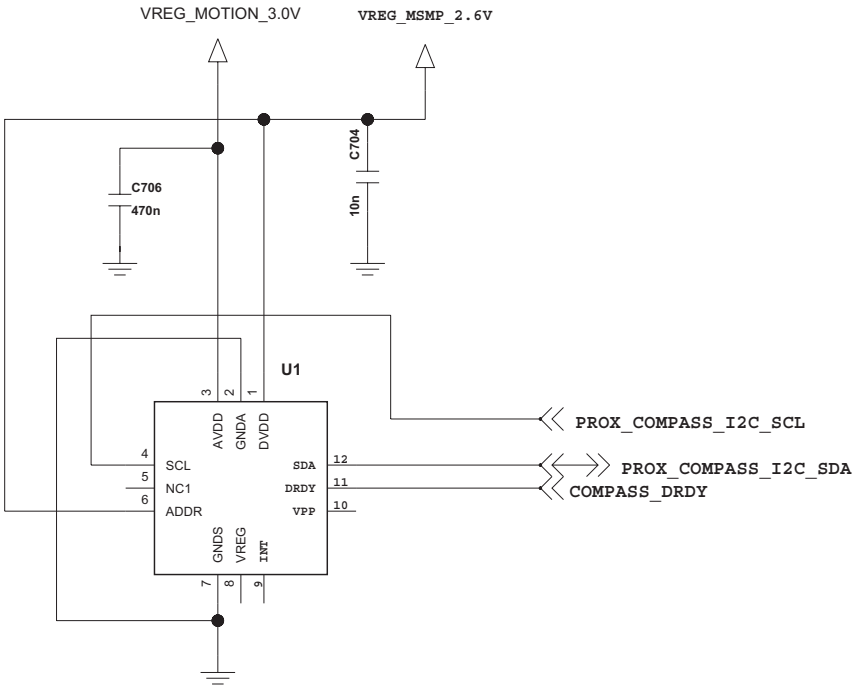


Figure. Compass Sensor Schematic

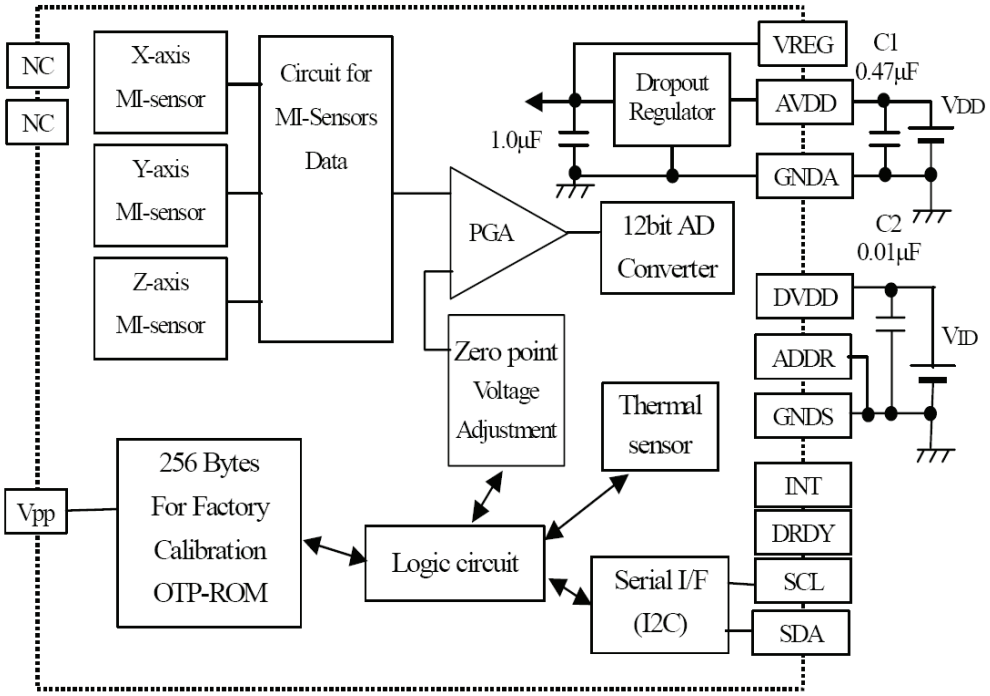


Figure. Compass Sensor Block Diagram

3.18 Motion Sensor

According to tilt the cell phone, the screen is had rotated automatically.

U503 : KR3DH IC used I2C interface to MSM7227

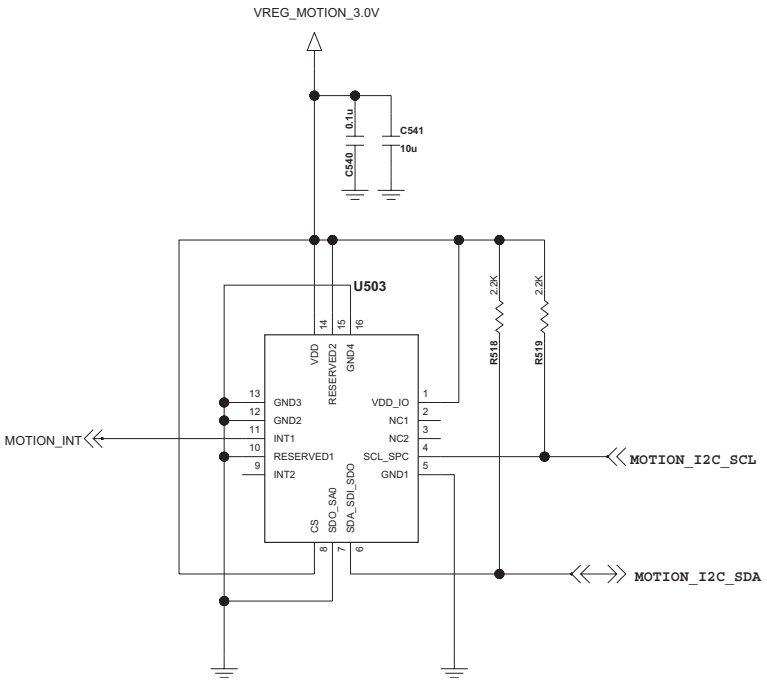


Figure. Motion Sensor Schematic

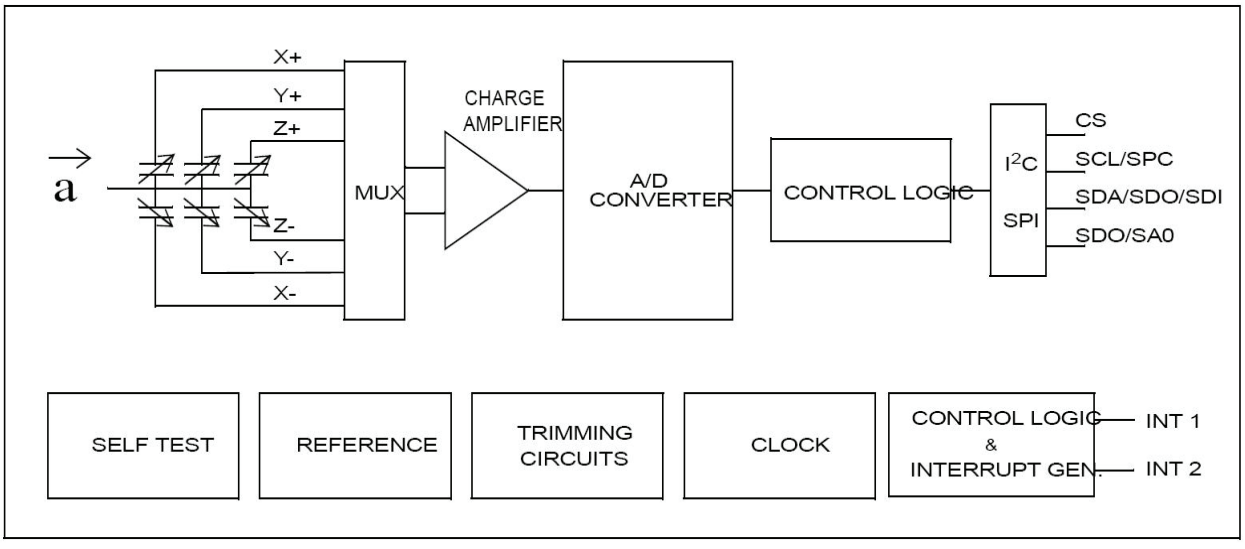


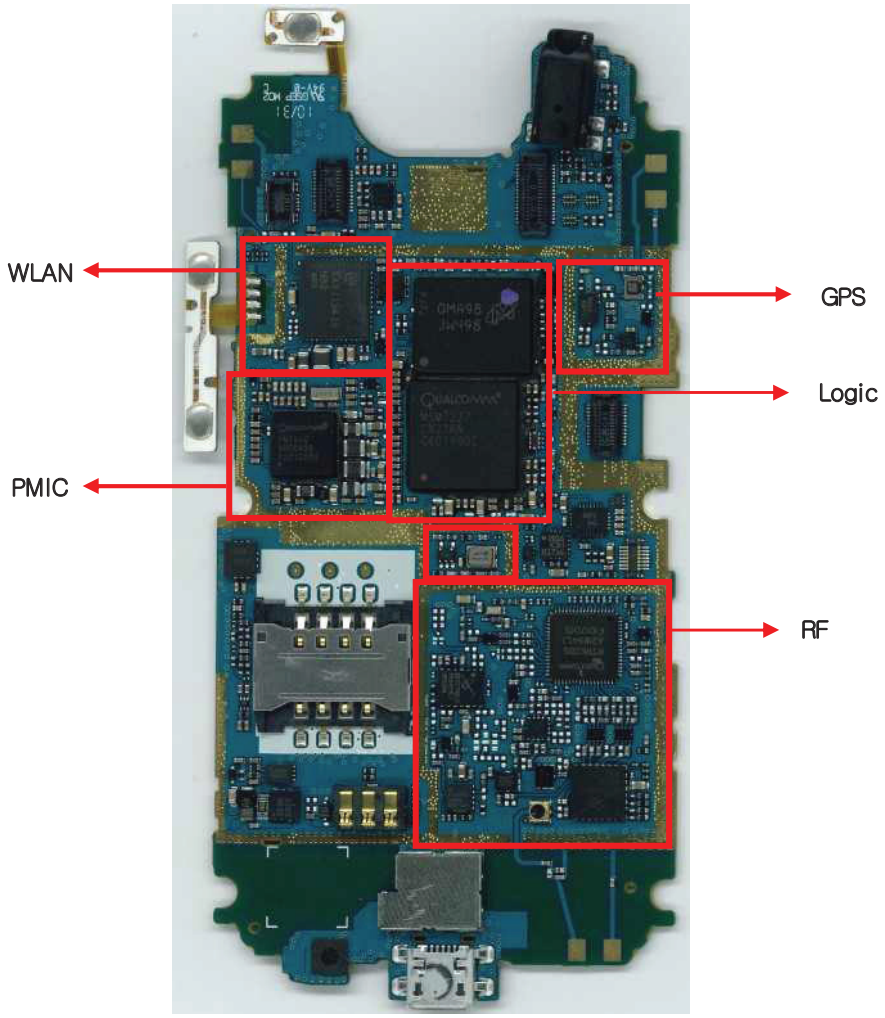
Figure. Compass Sensor Block Diagram

3.19 Main Features

3.19.1. LG-P500 Main Features

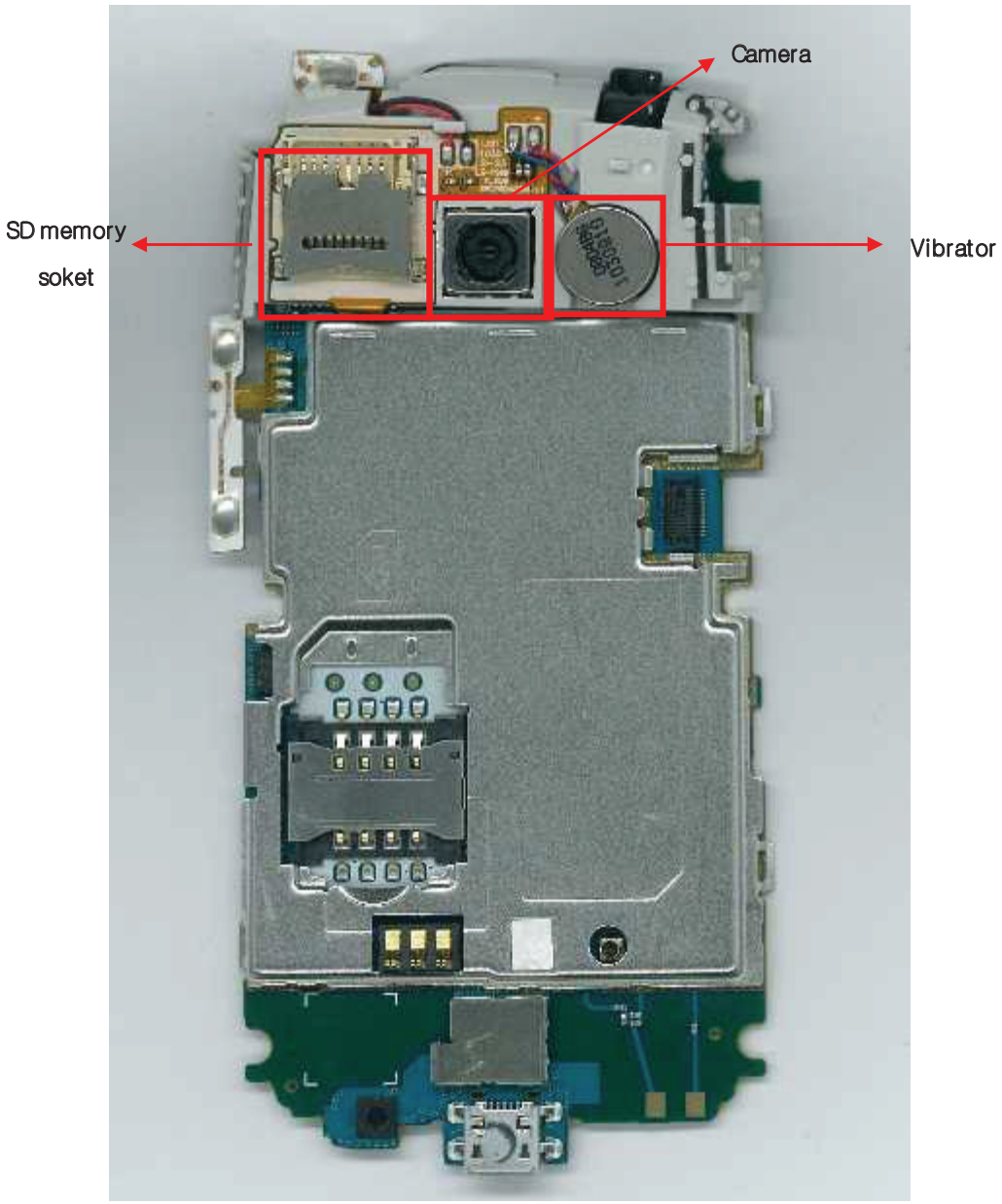
- DOP Type design
- UMTS 2100 + UMTS900+ GSM 900 + DCS 1800 + PCS 1900 + GSM850 based GSM/GPRS/EDGE/UMTS
- HSDPA 7.2Mbps
- TFT Main LCD(3.2' HVGA, 320 x 480)
- Capacitive/Electrostatic Touch Window
- 3M AF Camera
- 3.5Phi Stereo Headset & Speaker phone
- Mobile XMF –Mobile DLS / Scaleable Polyphony
- MP3/AMR/AAC/AAC/WAV/WMA decoder and play
- MPEG4 encoder/decoder and play/save
- JPEG en/decoder
- Supports Bluetooth and HS-USB
- Supports WLAN(802.11b, 802.11g)
- Supports FM Radio
- 1500 mAh (Li-Ion)

3.19.2. LG-P500 Main component (bottom)



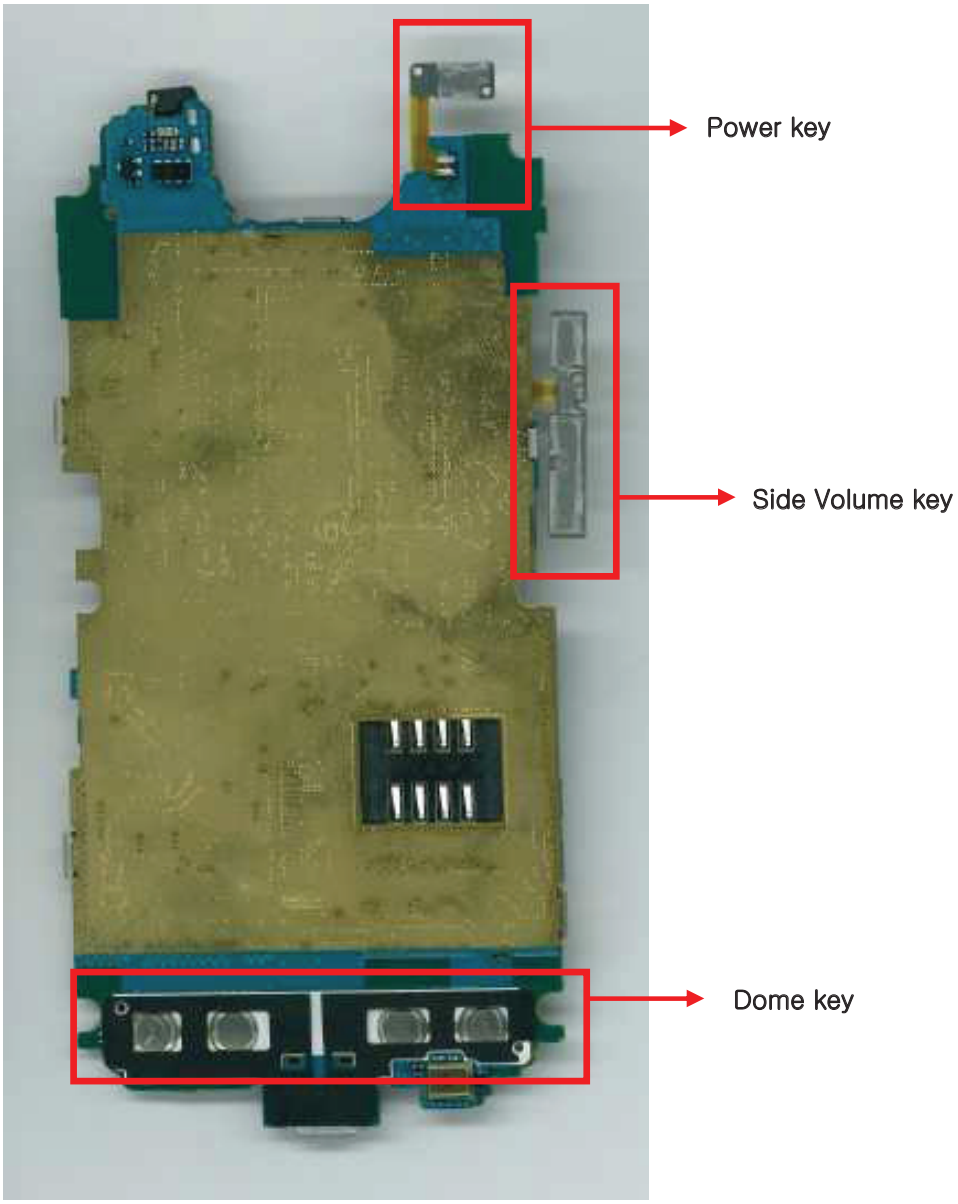
Main Board Bottom

3.19.2. LG-P500 Main component (bottom & Sub carrier)



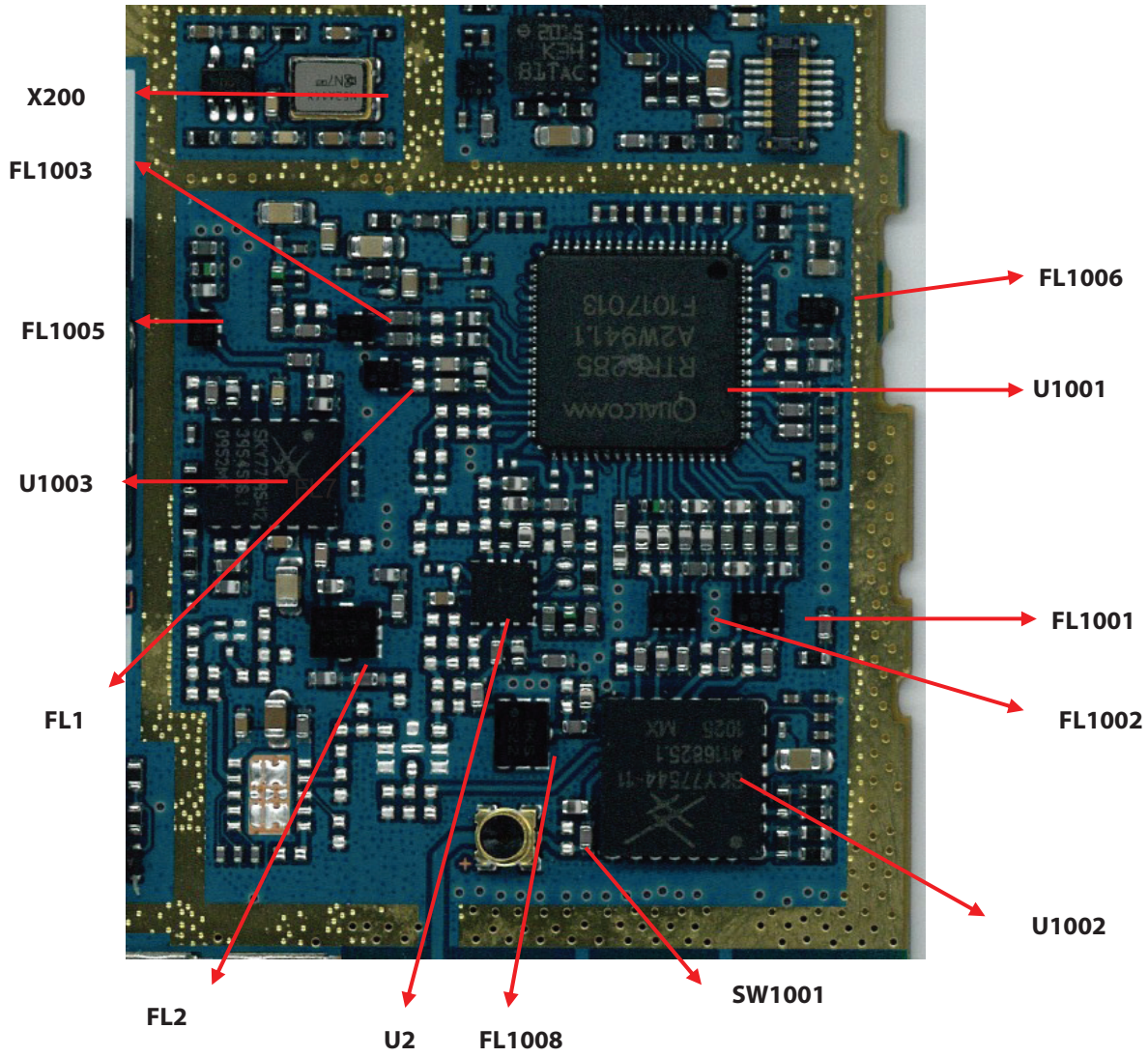
Main Board Bottom & Sub carrier

3.19.2. LG-P500 Main component (Top)



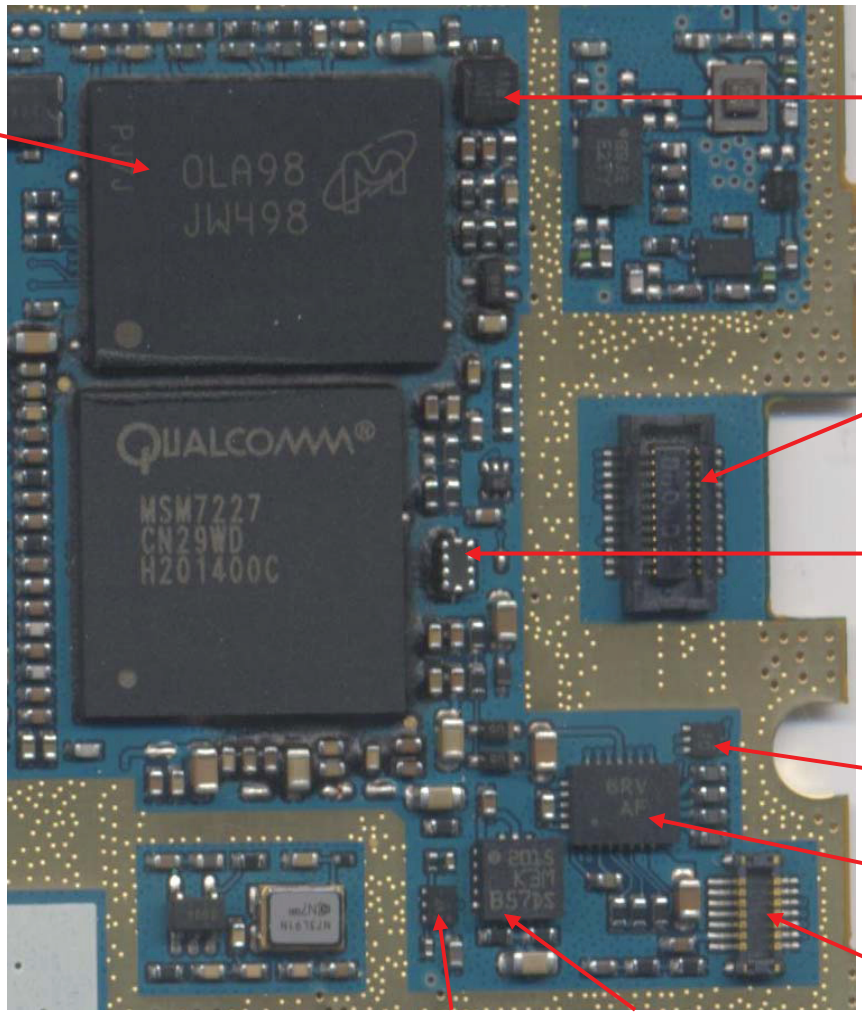
Main Board Top

3.19.3. RF of LG-P500



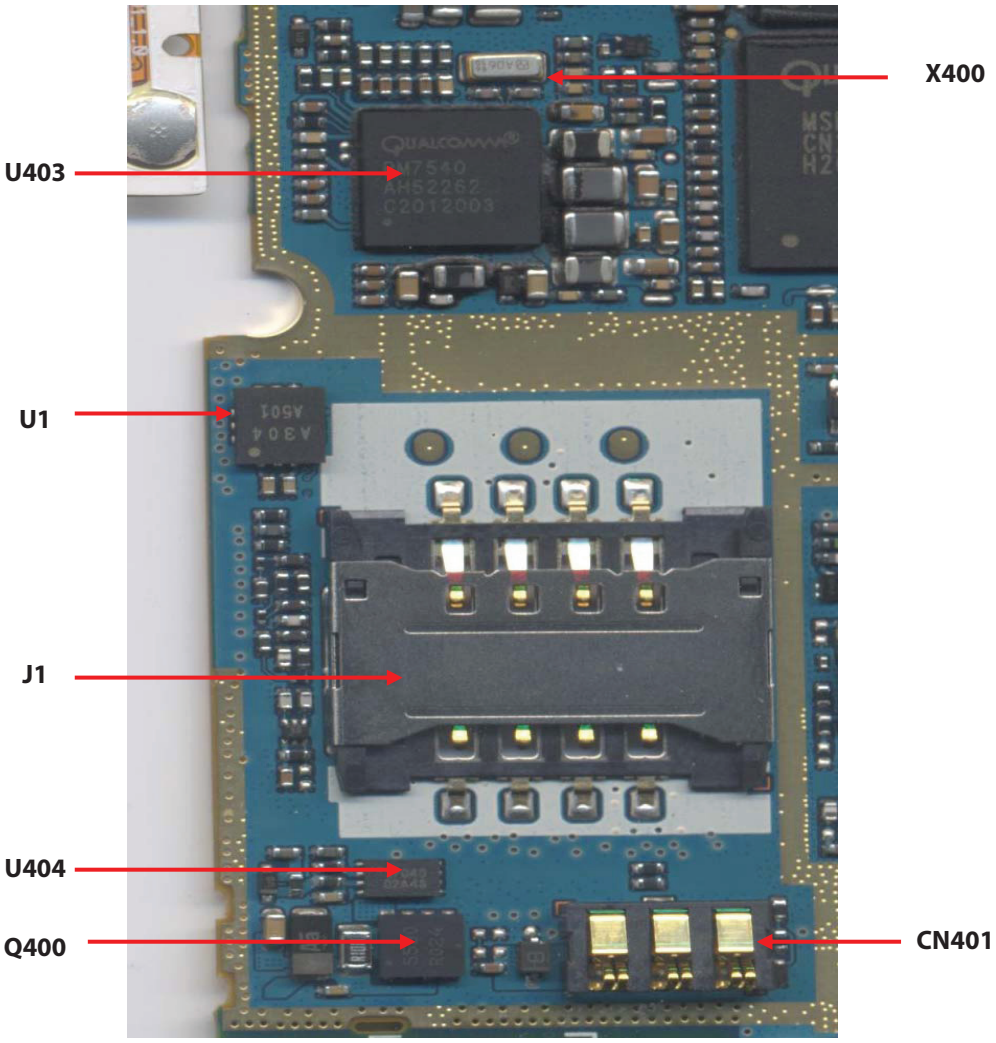
Reference	Description	Reference	Description
U1001	RTR6285	FL1005	WCDMA (VIII) TX SAW Filter
U1002	GSM PAM/FEM module	FL1006	WCDMA (I) TX SAW Filter
U1003	WCDMA PAM(I, VIII)	FL2	WCDMA (VIII) Duplexer
U2	External LNA(I, VIII)	FL1008	WCDMA (I) Duplexer
X200	TCXO	FL1001	GSM RX Dual SAW Filter
FL1003	WCDMA (I) RX SAW Filter	FL1002	GSM RX Dual SAW Filter
FL1	WCDMA (VIII) RX SAW Filter	SW1001	RF Antenna connector

3.19.4. BaseBand of LG-P500



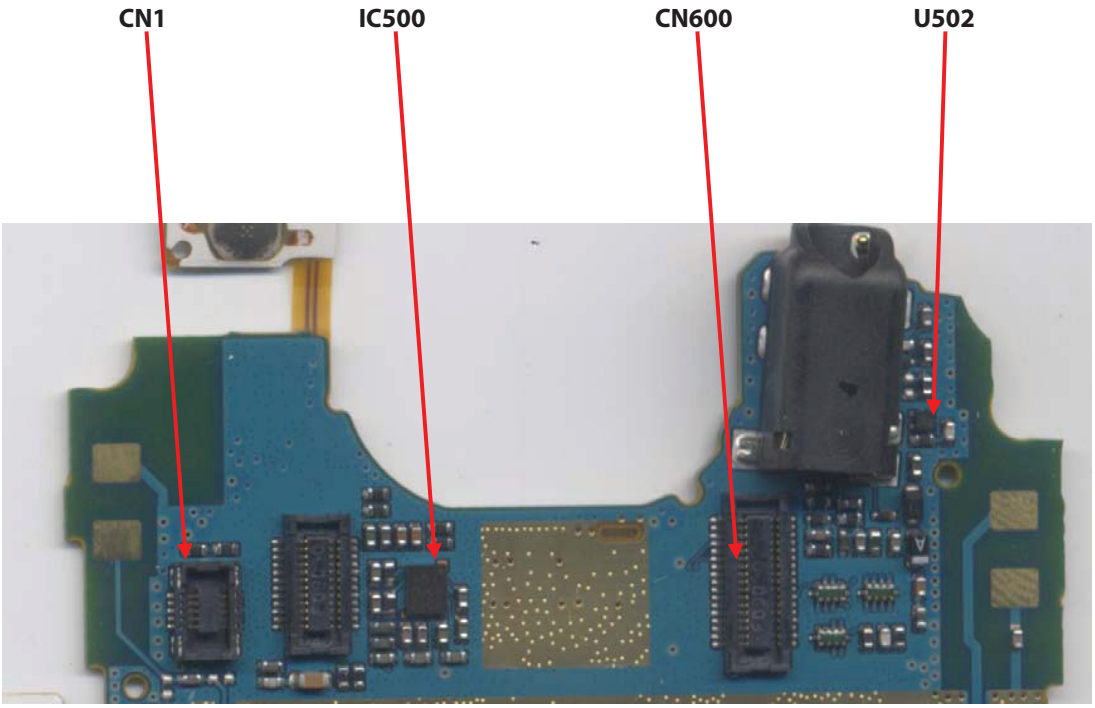
Reference	Description	Reference	Description
U301	Memory	U1007	Charge pump
U200	MSM7227	U503	Motion sensor
U602	Q-coin Motor drive amp	CN200	J-TAG CONN.
FL603	MDDI filter	CN601	LCD CONN.
U601	Level shifter	U502	GPS D flip-flop

3.19.5. Power and Logic of LG-P500



Reference	Description	Reference	Description
U403	PM7540	Q400	Charging IC
U1	Digital Compass	CN401	Battery Conn.
J1	SIM connector	X400	Sleep X-tal
U404	Fuel gauge IC		

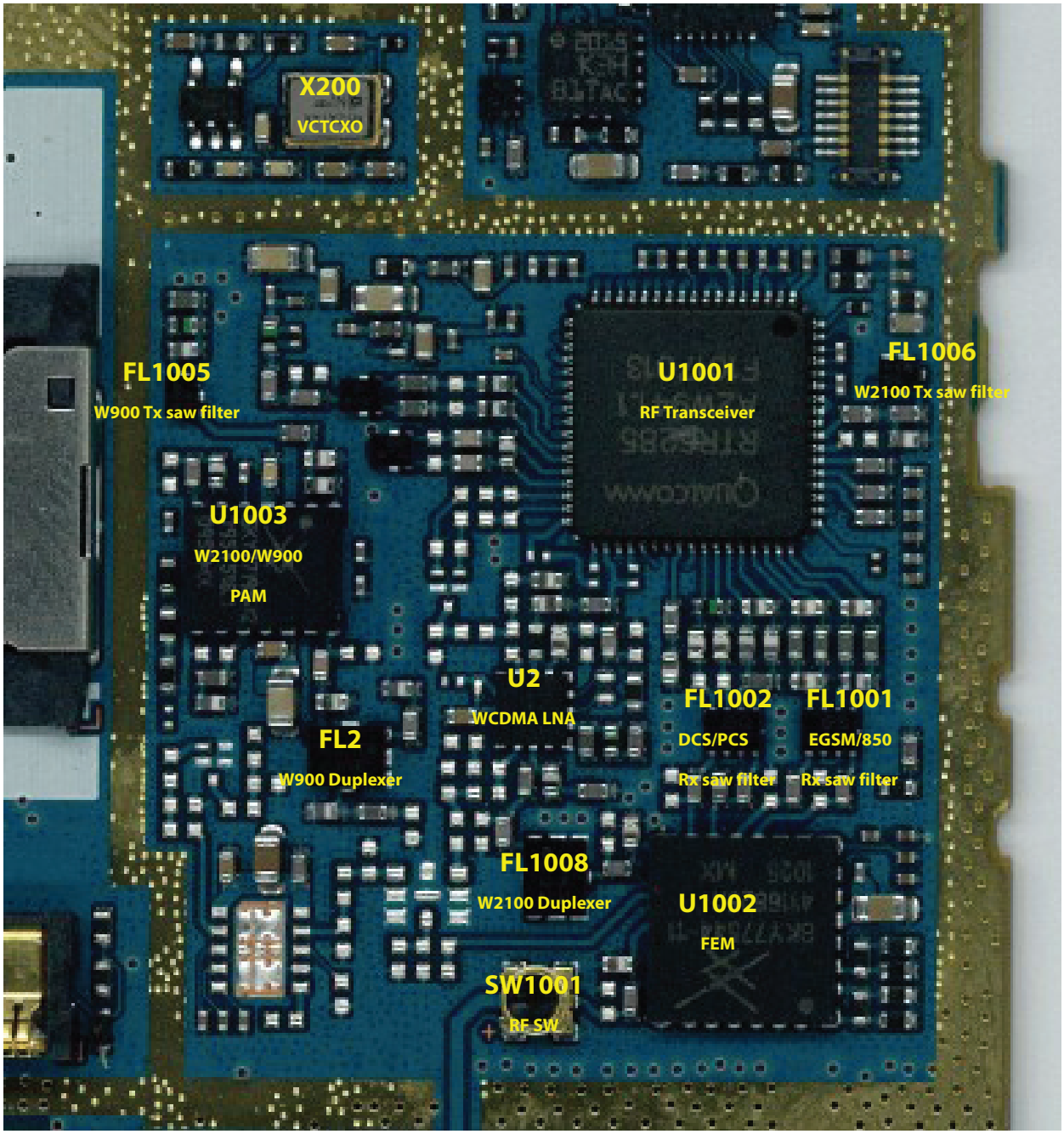
3.19.6. Audio of LG-P500

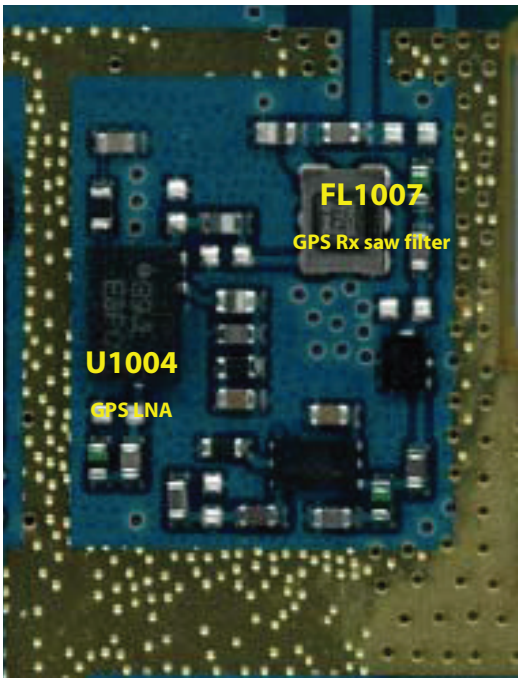


Reference	Description	Reference	Description
CN1	Touch Conn.	CN600	Camera conn.
CN2	Sub FPCB B2B conn.	U502	Headset Bias LDO
IC500	Audio Sub system		

4. TROUBLE SHOOTING

4.1 RF Component

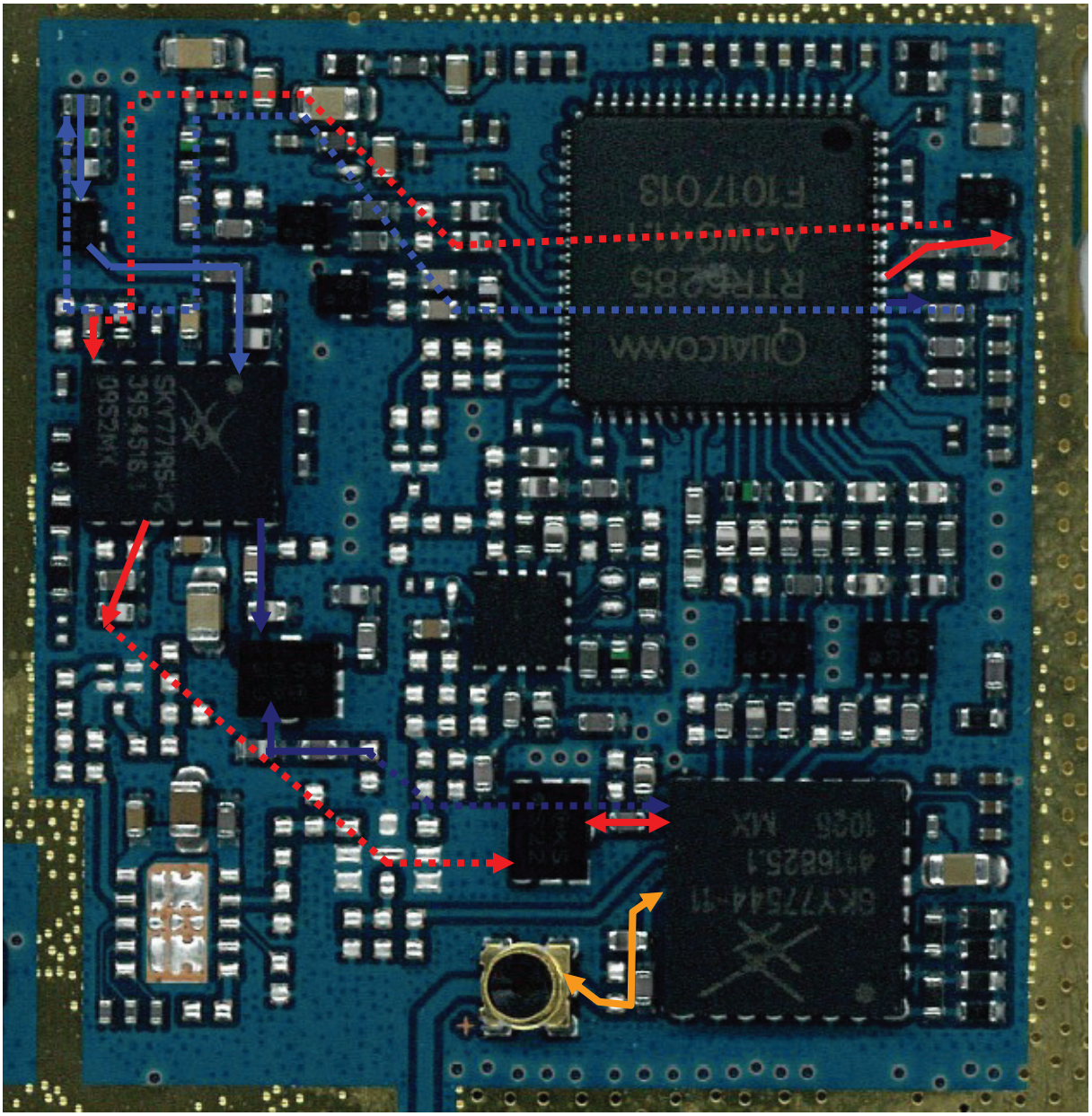




RF component (WCDMA / GSM)

Reference	Description	Reference	Description
U1001	RTR6285(Transceiver)	FL2	WCDMA (VIII) Duplexer
U1002	GSM TX Module (FEM + GSM/EDGE PAM)	U2	WCDMA (I, VIII) LNA
U1003	WCDMA Dual (I,VIII) PAM	X200	VCTCXO(19.2MHz)
FL1006	WCDMA (I) TX SAW Filter	U1004	GPS LNA
FL1005	WCDMA (VIII) TX SAW Filter	FL1007	GPS SAW Filter
FL1008	WCDMA (I) Duplexer	SW1001	RF Antenna Connector

4.2 SIGNAL PATH

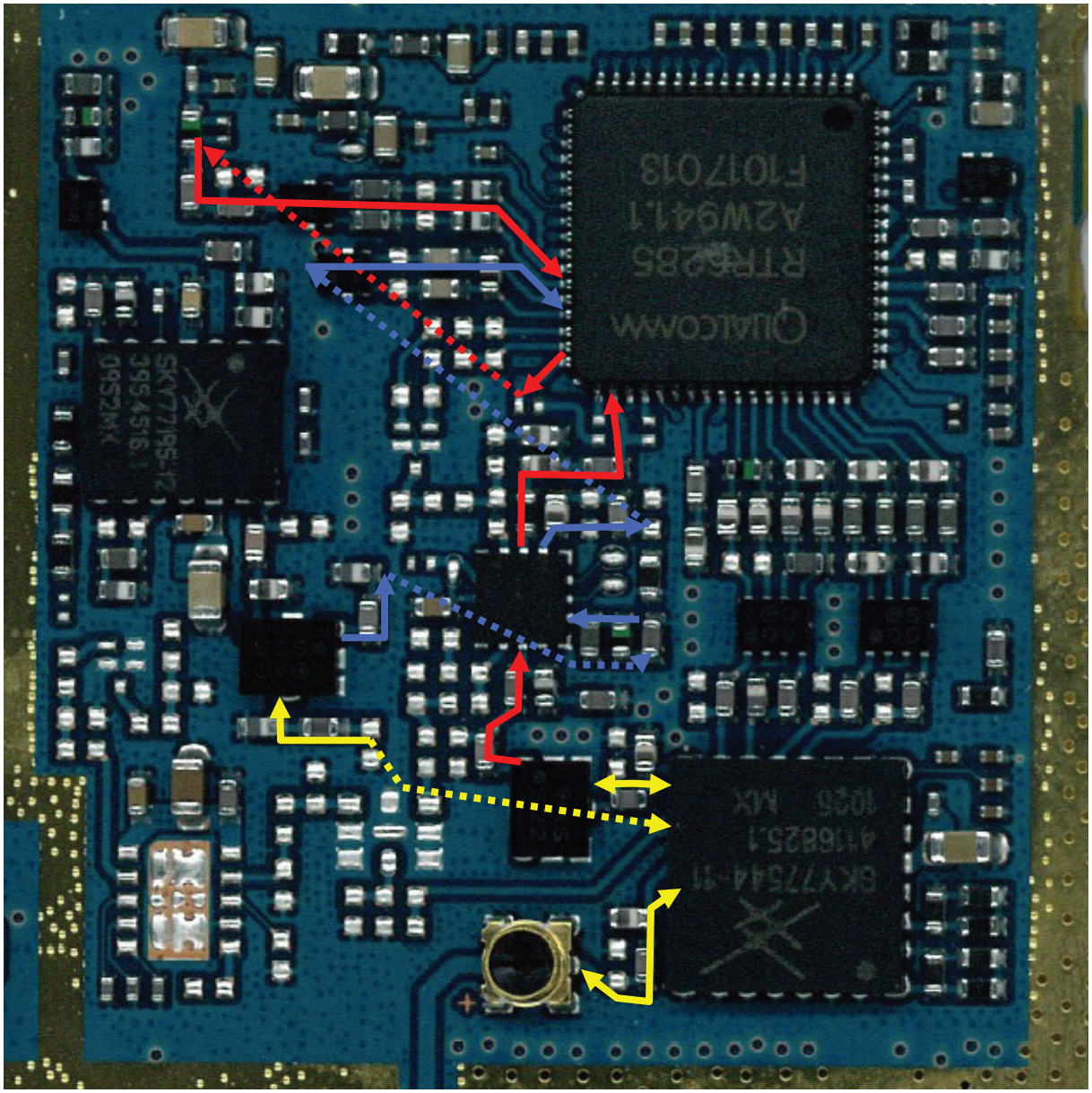


WCDMA I and VIII Band TX Signal PATH

D2. WCDMA 2100 TX PATH

E2. WCDMA 900 TX PATH

F1. COMMON TX/RX PATH

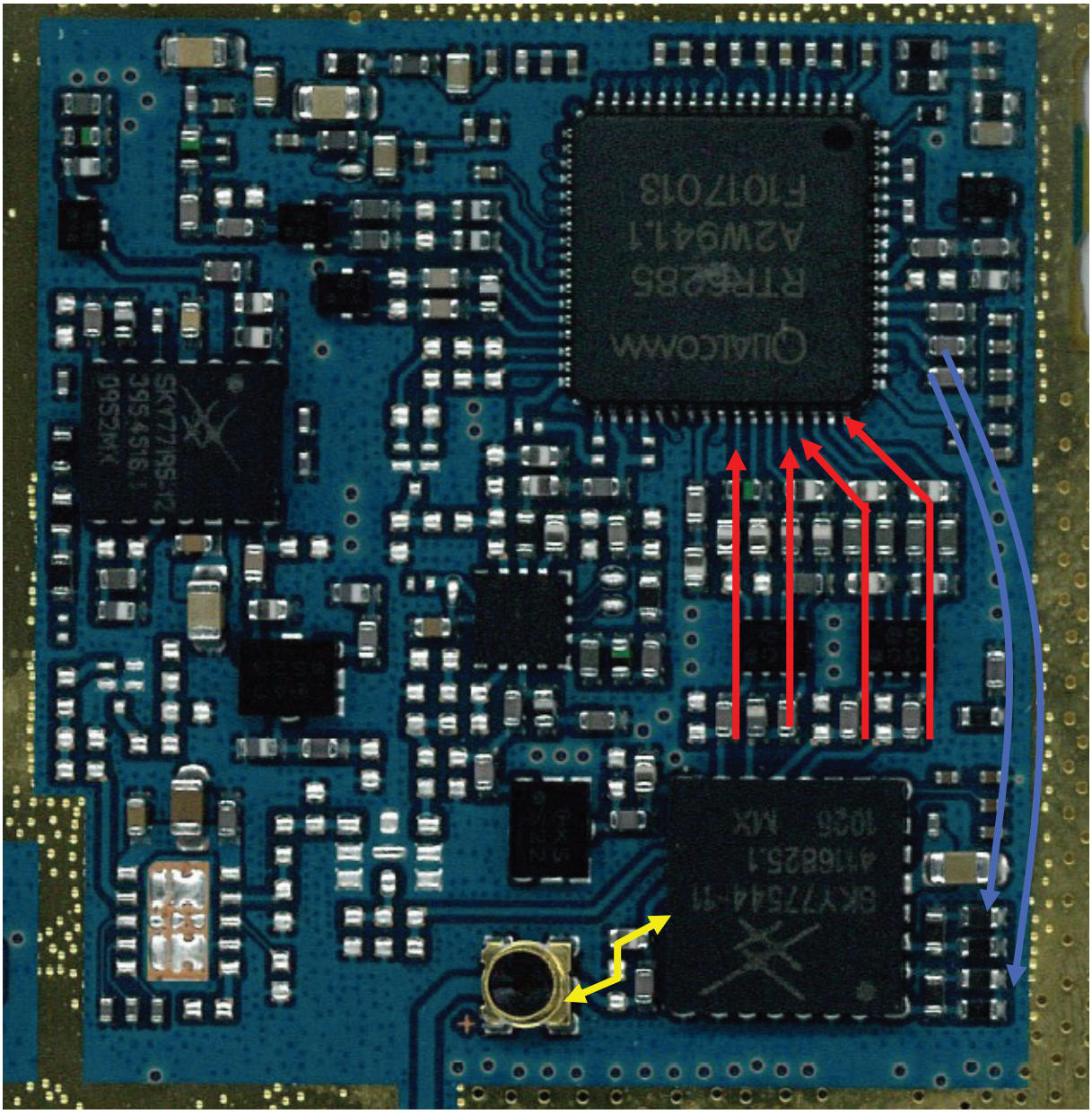


WCDMA BAND I and VIII RX Signal PATH

D1. WCDMA 2100 RX PATH

E1. WCDMA 900 RX PATH

F1. COMMON TX/RX PATH



GSM850/GSM900/DCS/PCS's RX/TX Signal PATH

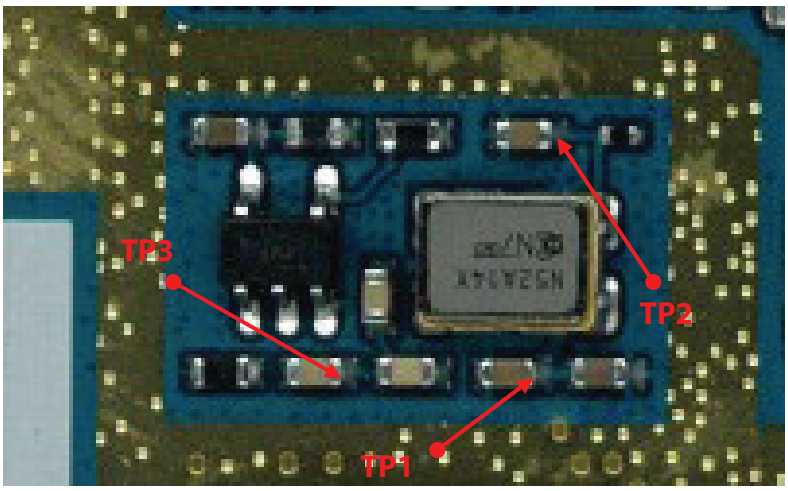
A. GSM850/GSM900/DCS1800/PCS1900 RX PATH

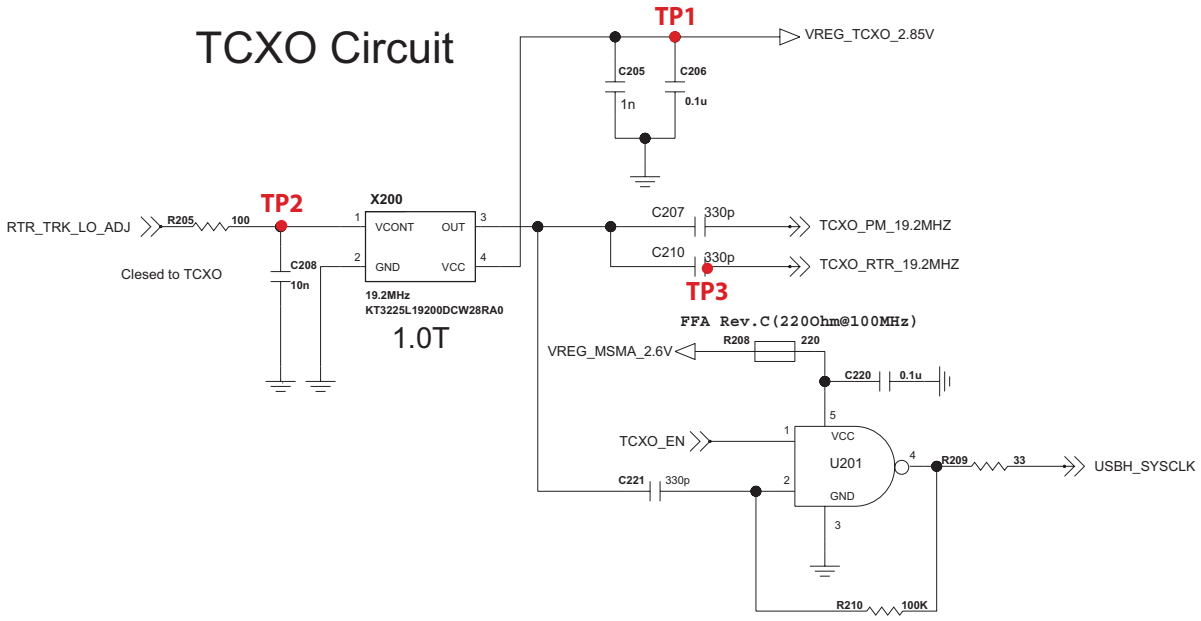
B. GSM850/GSM900/DCS1800/PCS1900 TX PATH

C. COMMON TX/RX PATH

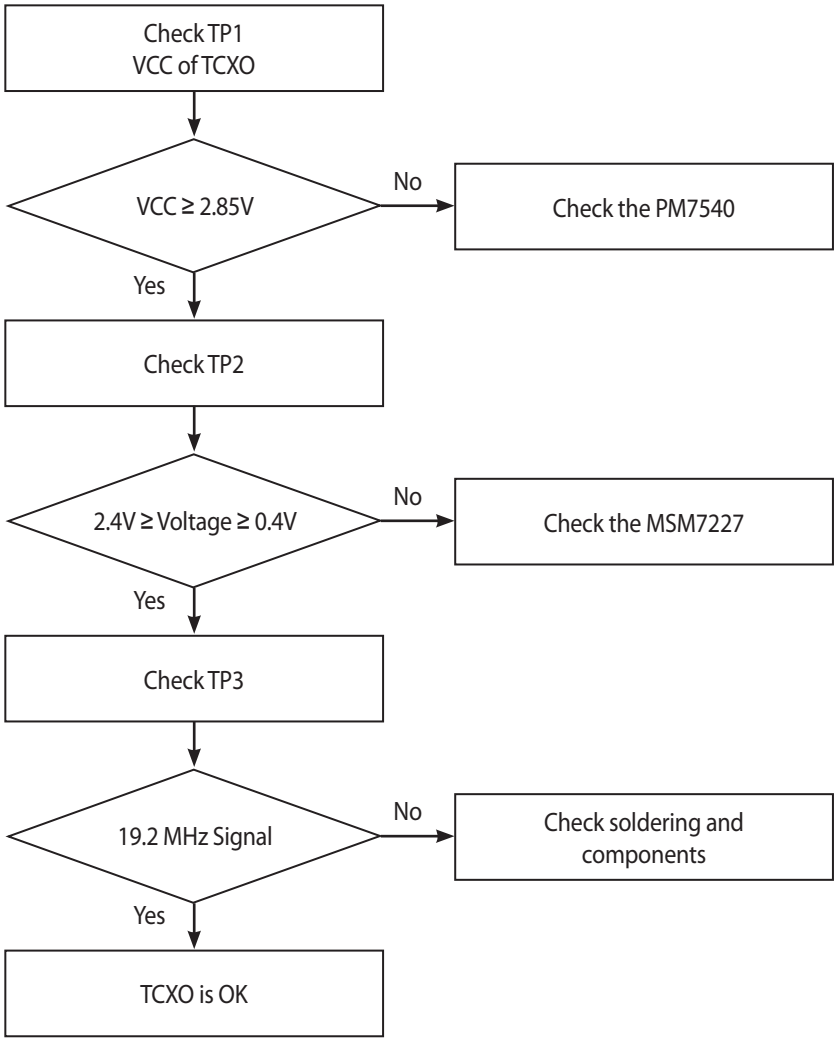
4.3 Checking TCXO Block

The output frequency (19.2MHz) of TCXO (X200) is used as the reference one of RTR6285 and PM7540 internal VCO.

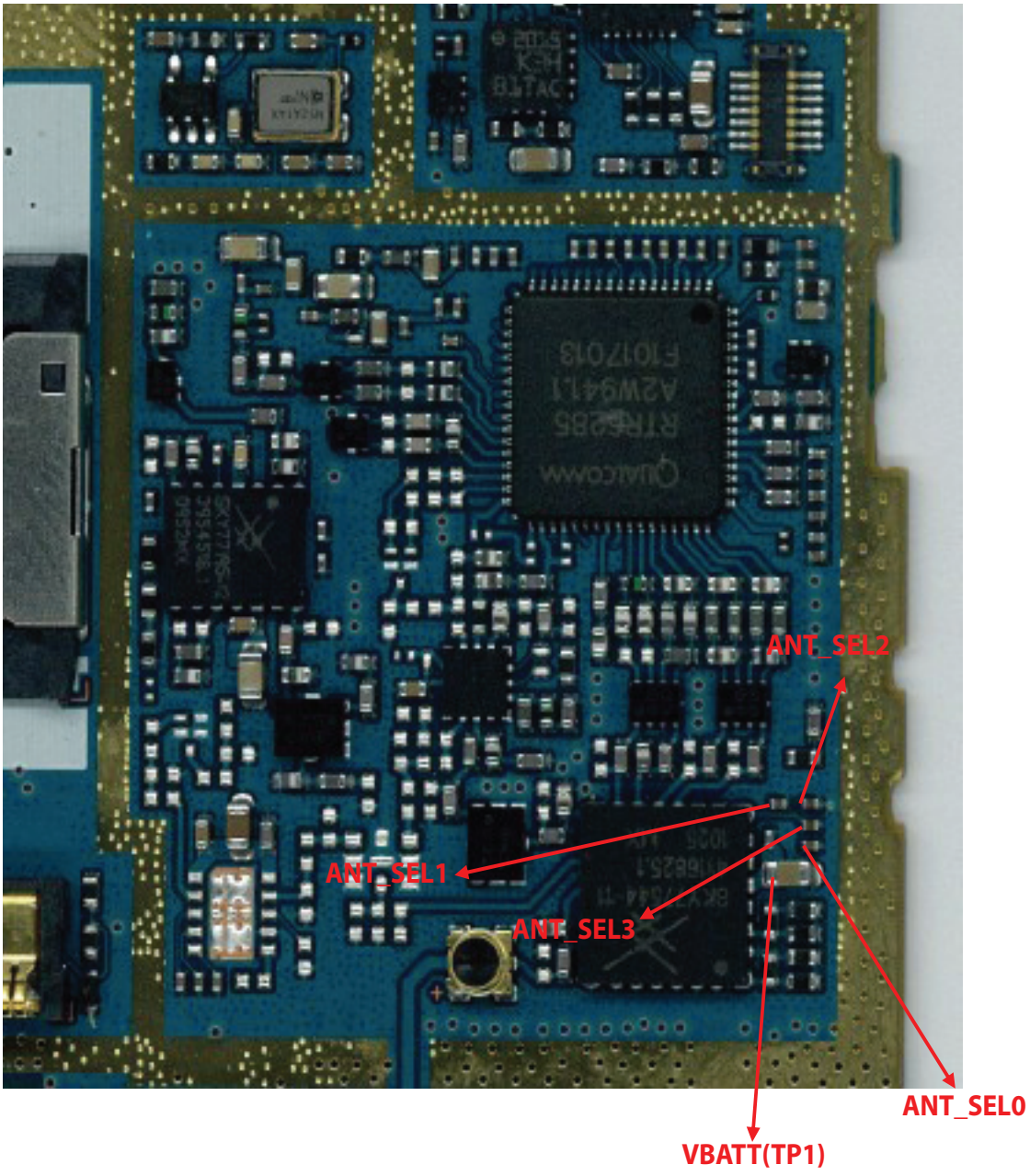


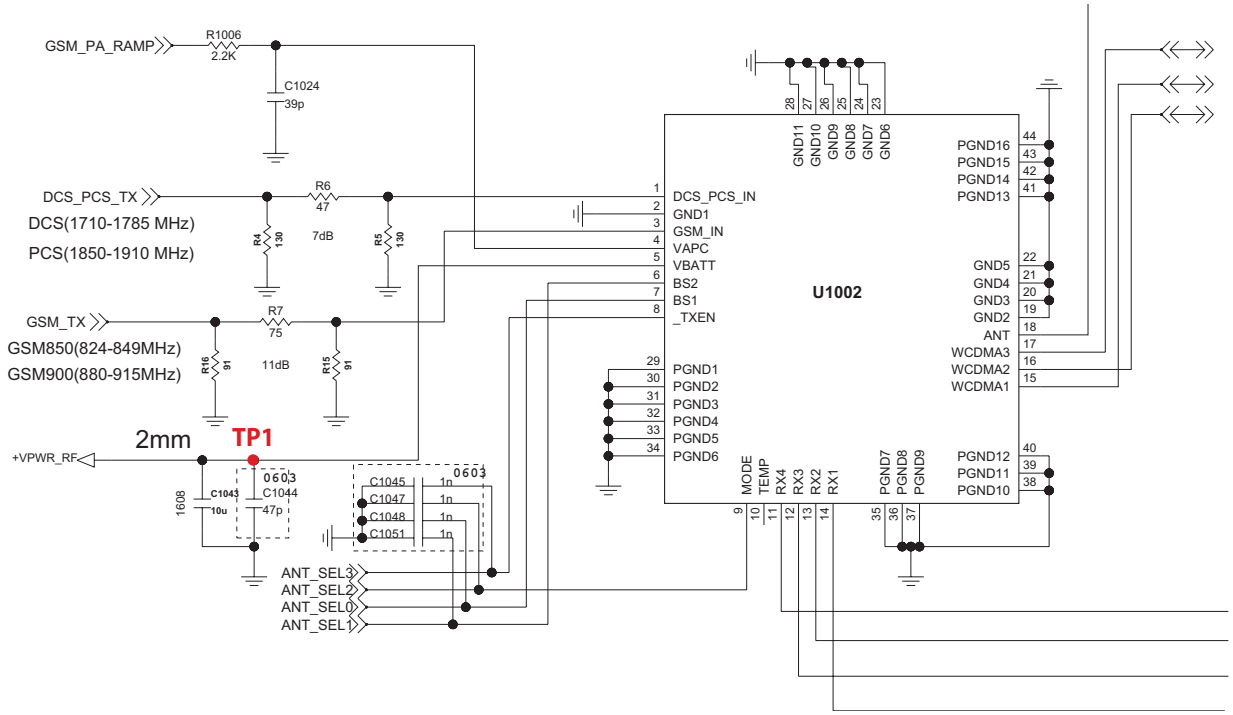


Schematic of the Crystal Part (19.2MHz)



4.4 Checking GSM TX Module(GSM PAM + FEM) Block

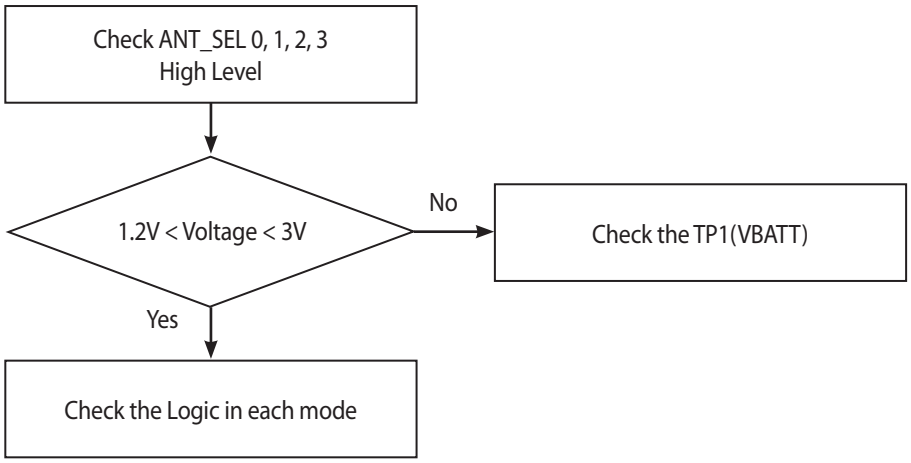




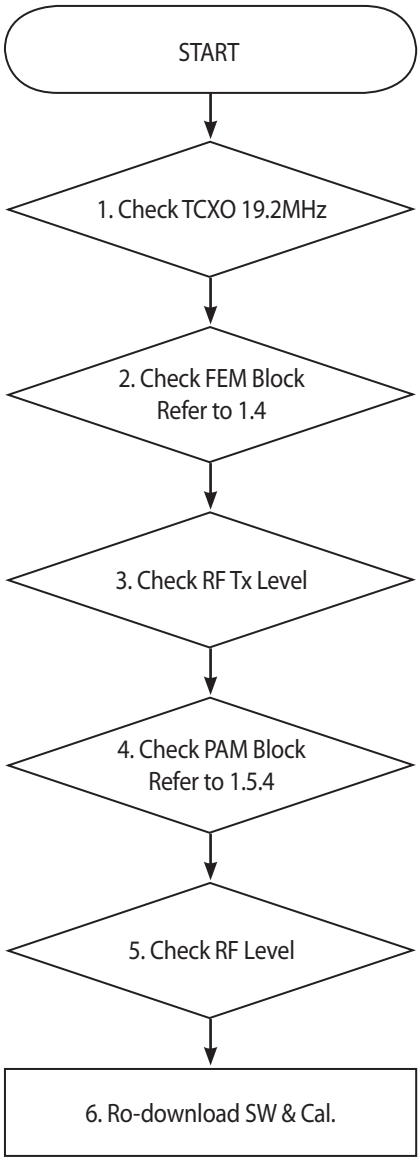
Schematic of the Antenna Switch Block

ANTENNA SWITCH MODULE LOGIC(SKY77544)

	ANT_SEL0	ANT_SEL1	ANT_SEL2	ANT_SEL3
GSM850/GSM900 TX	LOW	HIGH	LOW	LOW
DCS1800/PCS1900 TX	HIGH	HIGH	LOW	LOW
PCS1900 RX	LOW	LOW	LOW (X)	HIGH
DCS1800 RX	LOW	HIGH	LOW (X)	HIGH
GSM900 RX	HIGH	HIGH	LOW (X)	HIGH
GSM850 RX	HIGH	LOW	LOW (X)	HIGH
W2100	HIGH	LOW	LOW	LOW
W900(W850)	LOW	LOW	HIGH	LOW
W1700	HIGH	LOW	HIGH	LOW



4.5 Checking WCDMA Block



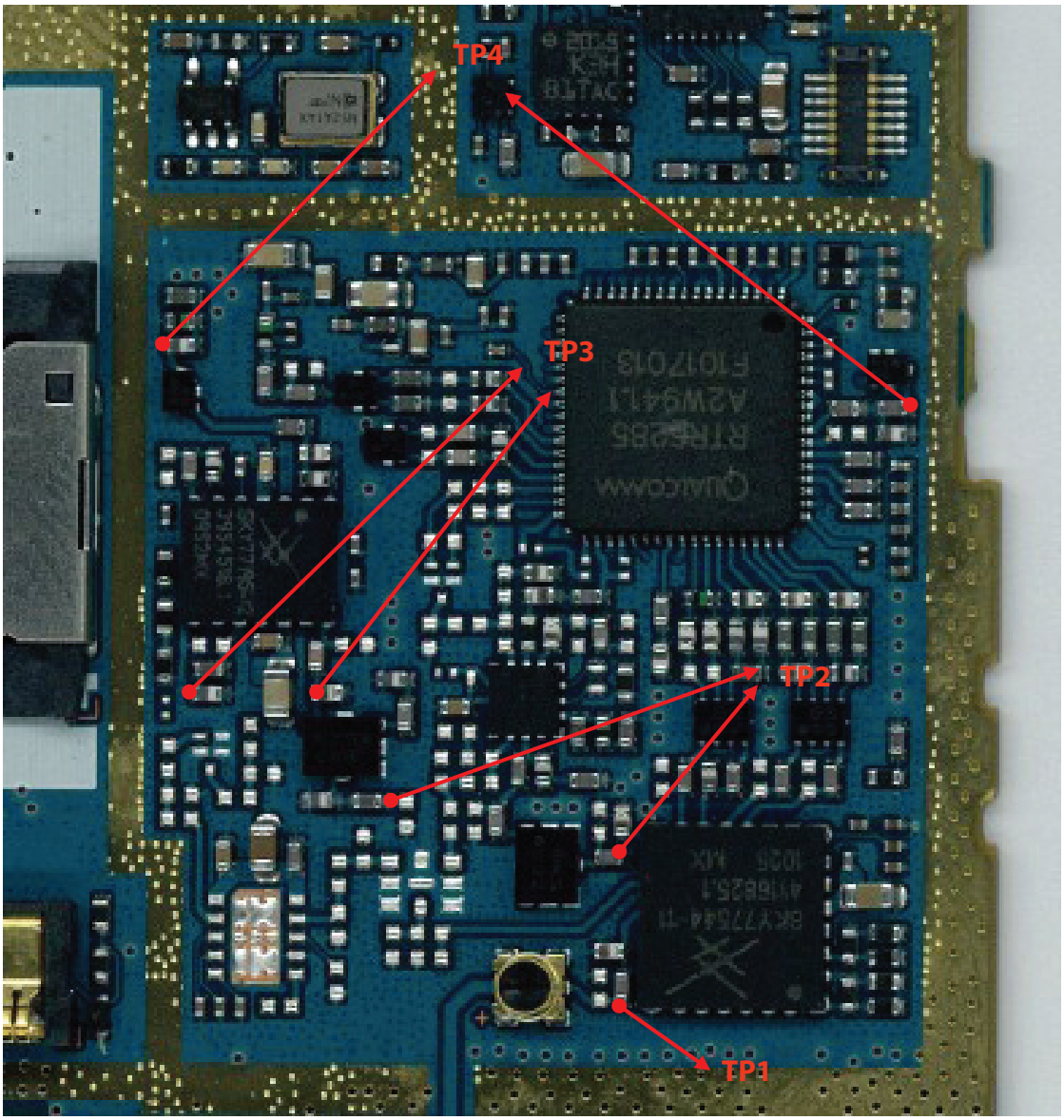
4.5.1Checking TCXO Block

Refer to 1.3

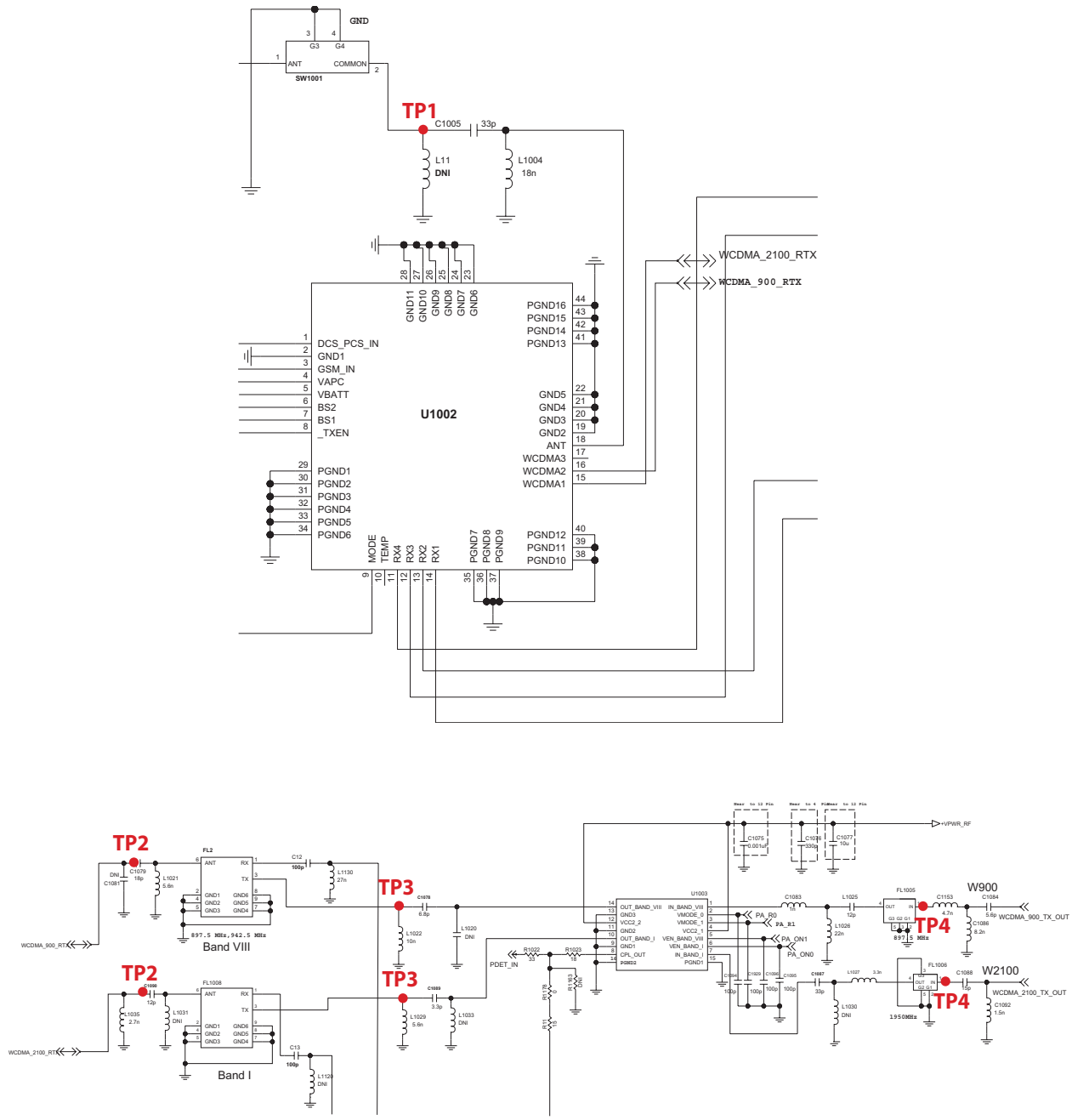
4.5.2. Checking FEM Block

Refer to 1.4

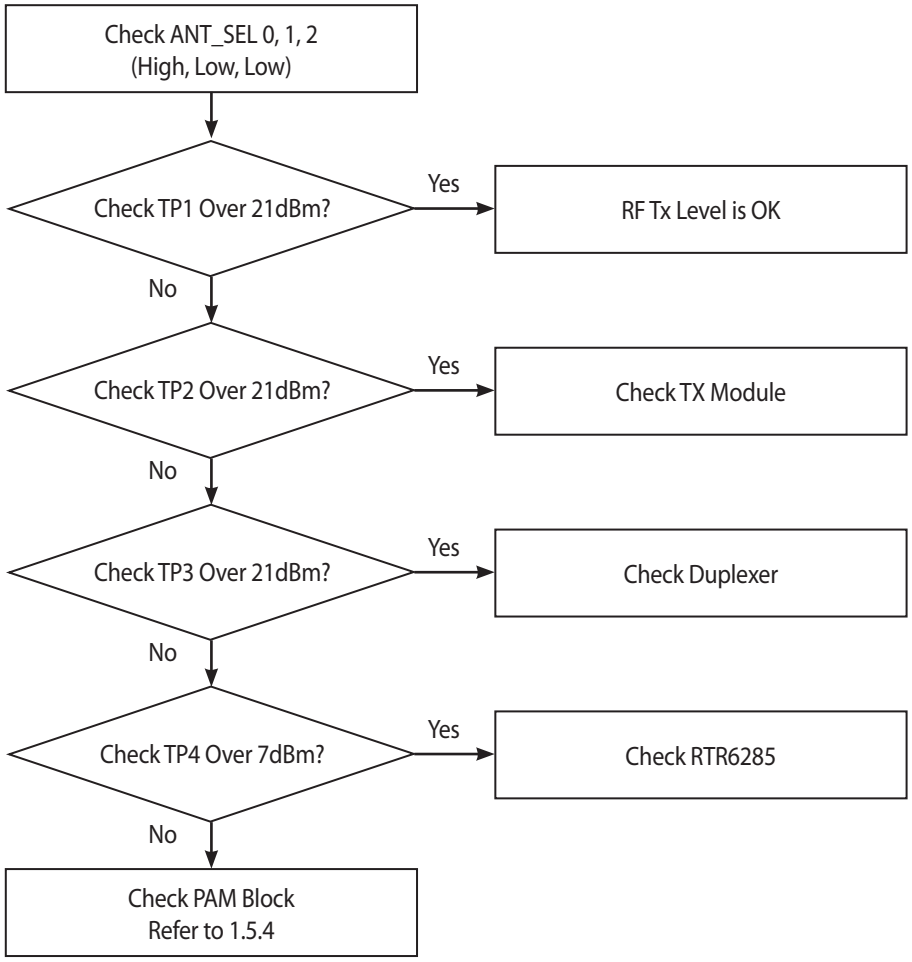
4.5.3. Checking RF TX Level



Test Point (TX Level)



For testing, Max power output is needed.



RTR6285 Maximun output Power = 7dBm
RTR6285 minimun output Power = -80dBm

4.5.4. Checking PAM Block

PAM control signal

W_PA_ON (W_900_PA_ON(C1096), W_2100_PA_ON(C1095) and) : PAM Enable

W_PA_RO: PAM Gain Control

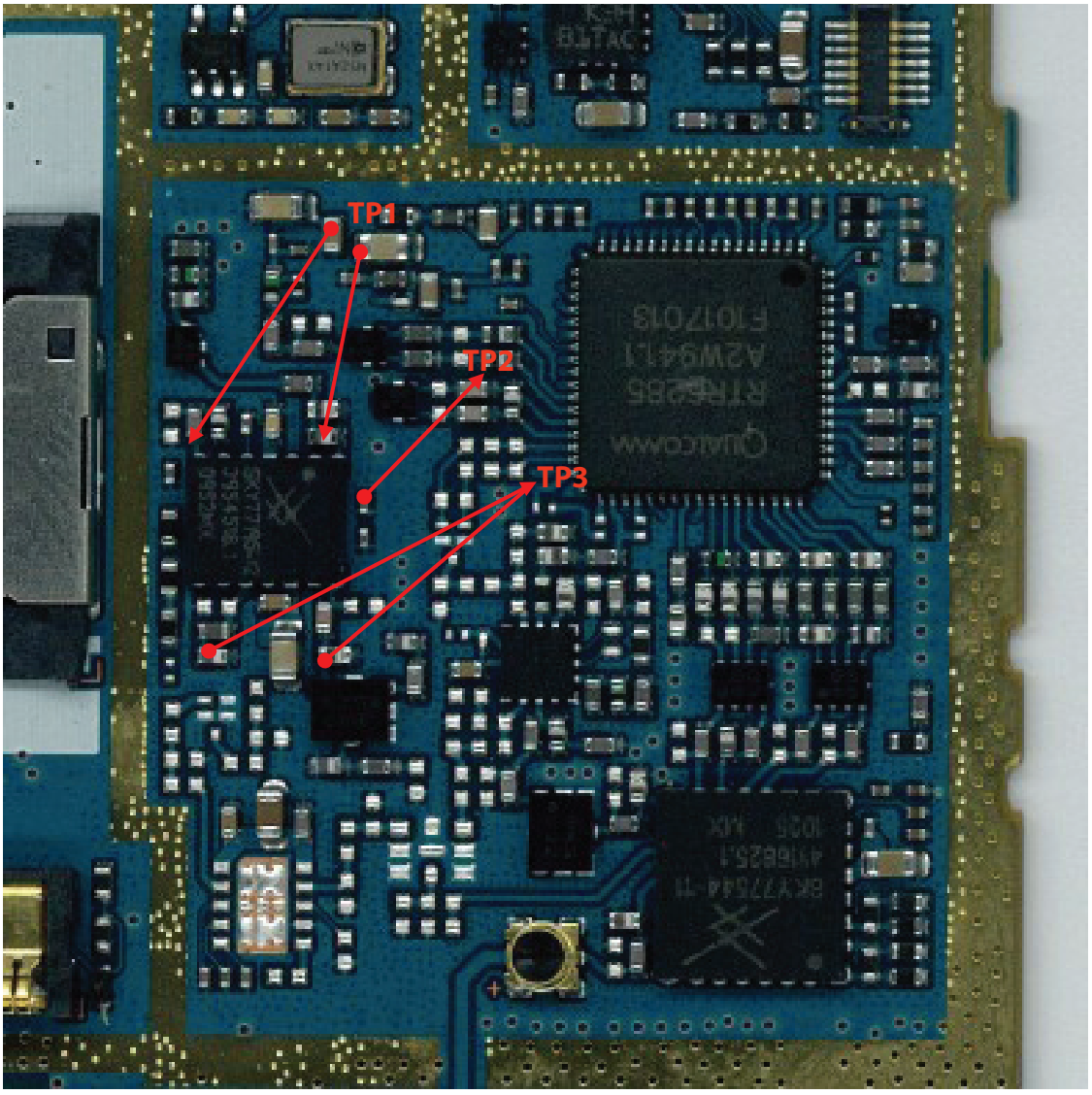
W_PA_ON must be HIGH (over 2.6V)

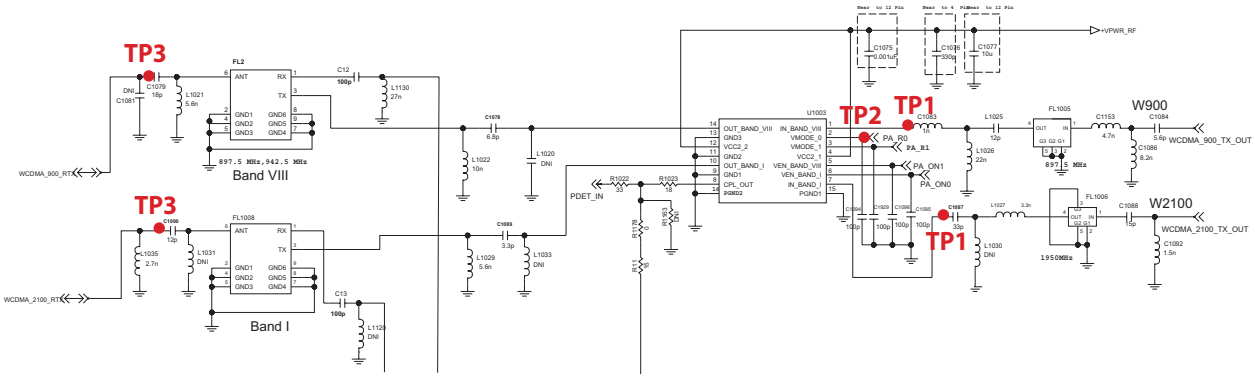
PAM IN/OUT Signal :

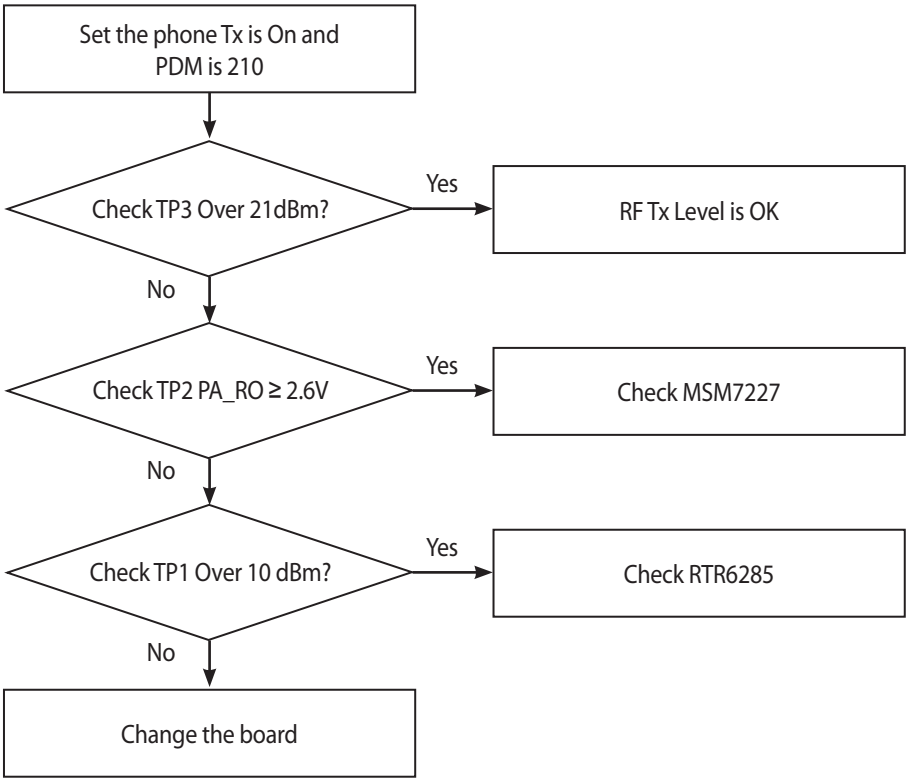
When PAM is under the operation of high power mode (WCDMA_PA_R0(C1929):Low),

PAM OUT power must be over 21 dBm

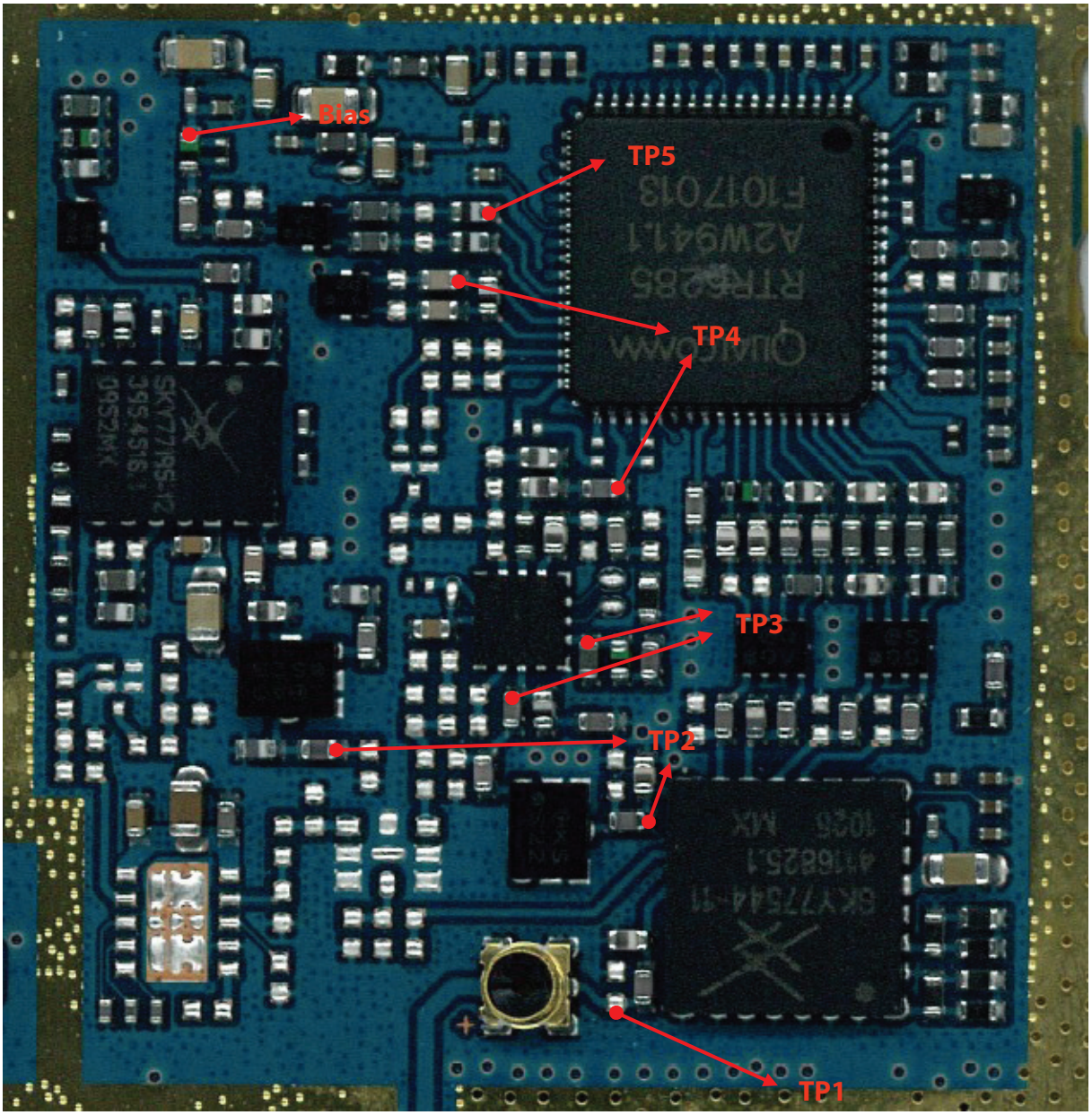
PAM IN power must be under 10 dBm



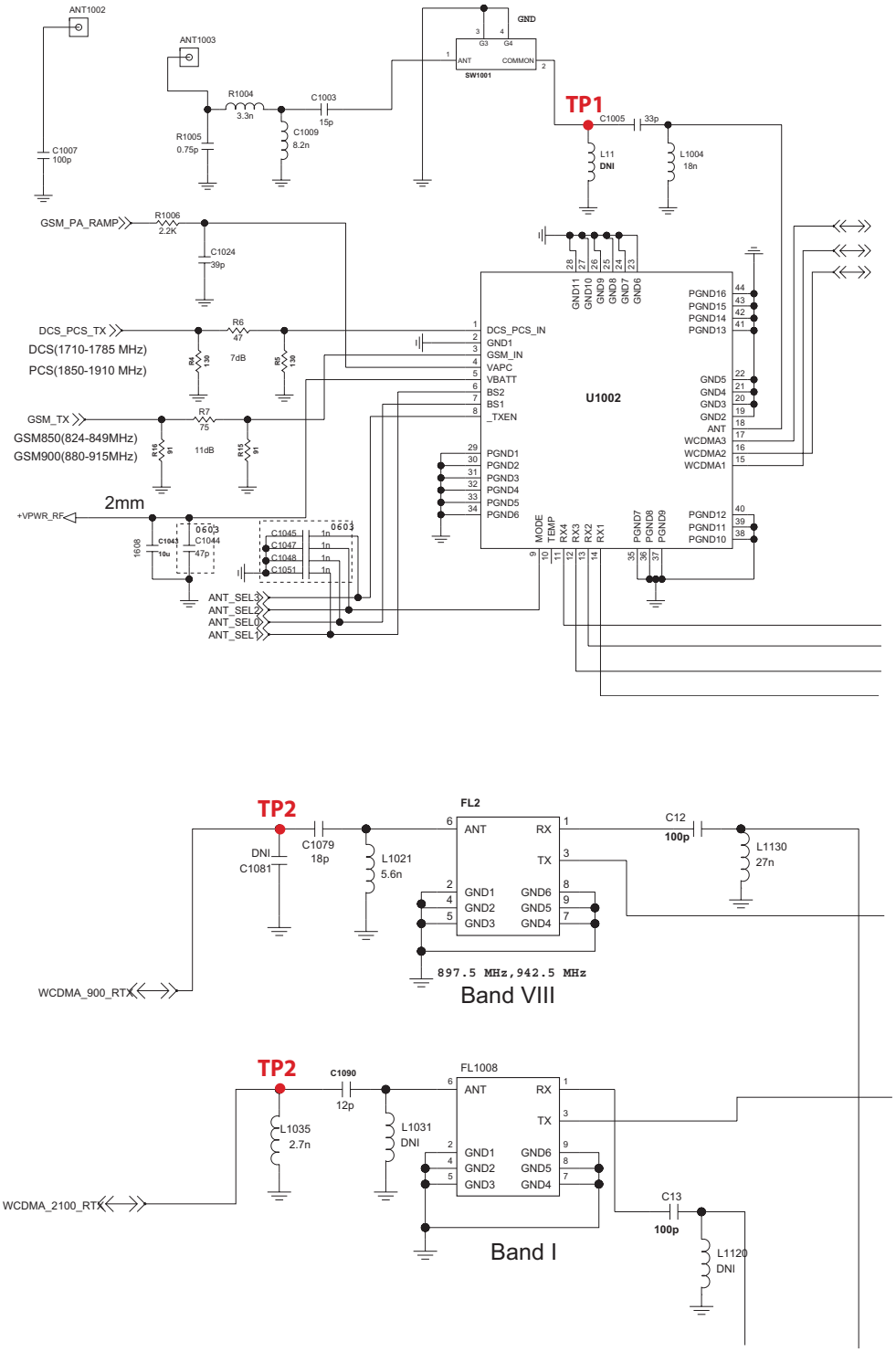


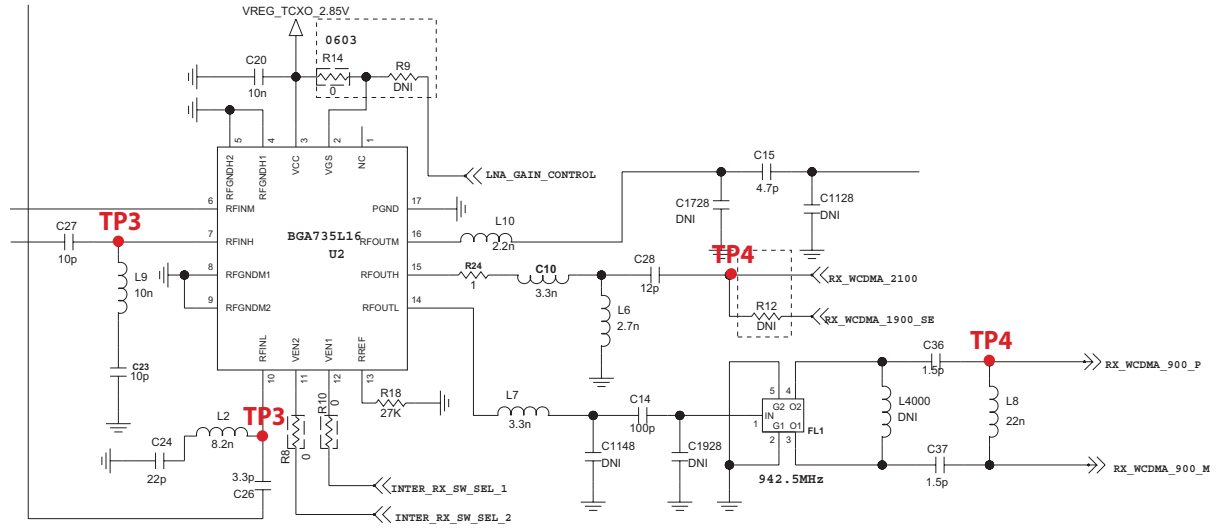


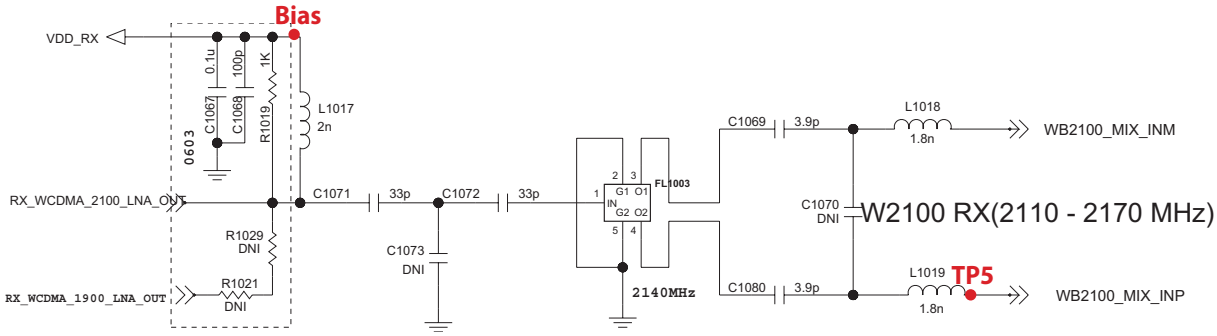
4.5.5. Checking RF Rx Level

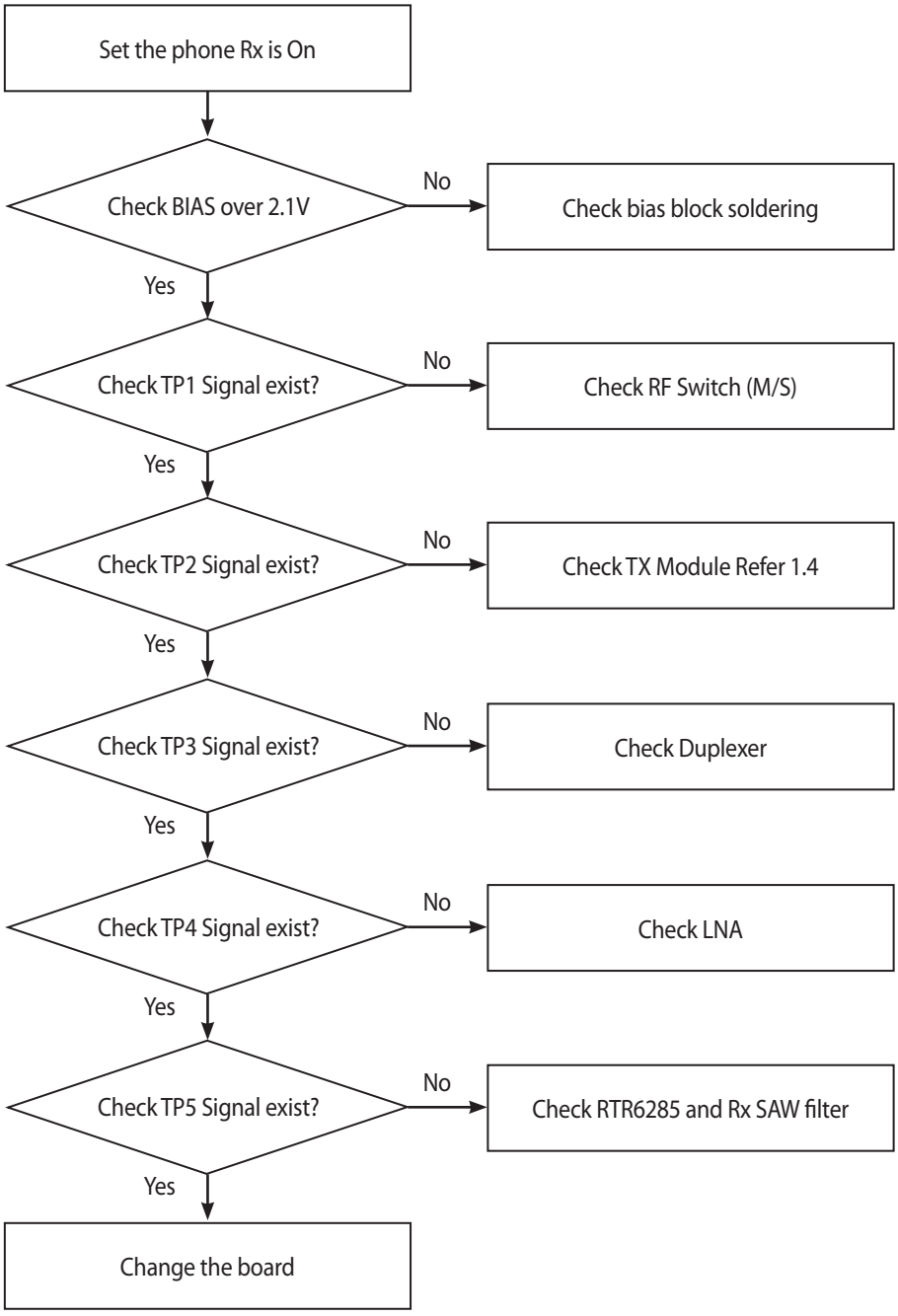


Test Point (RF Rx Level)

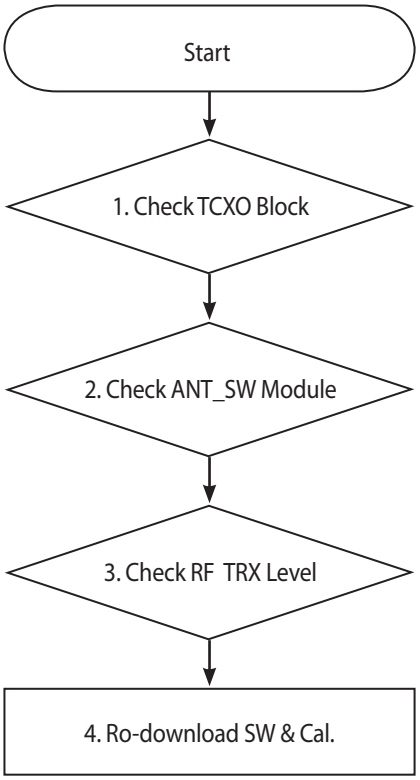


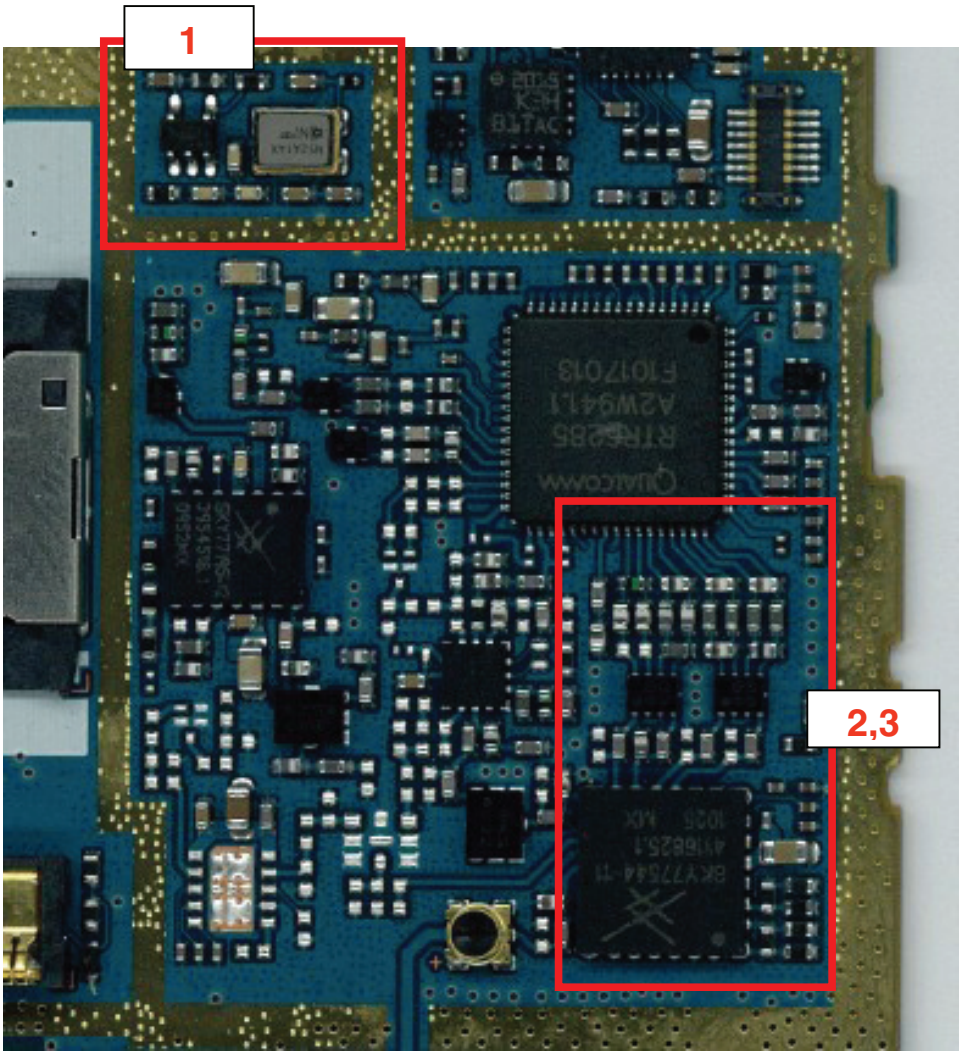






4.6 Checking GSM Block





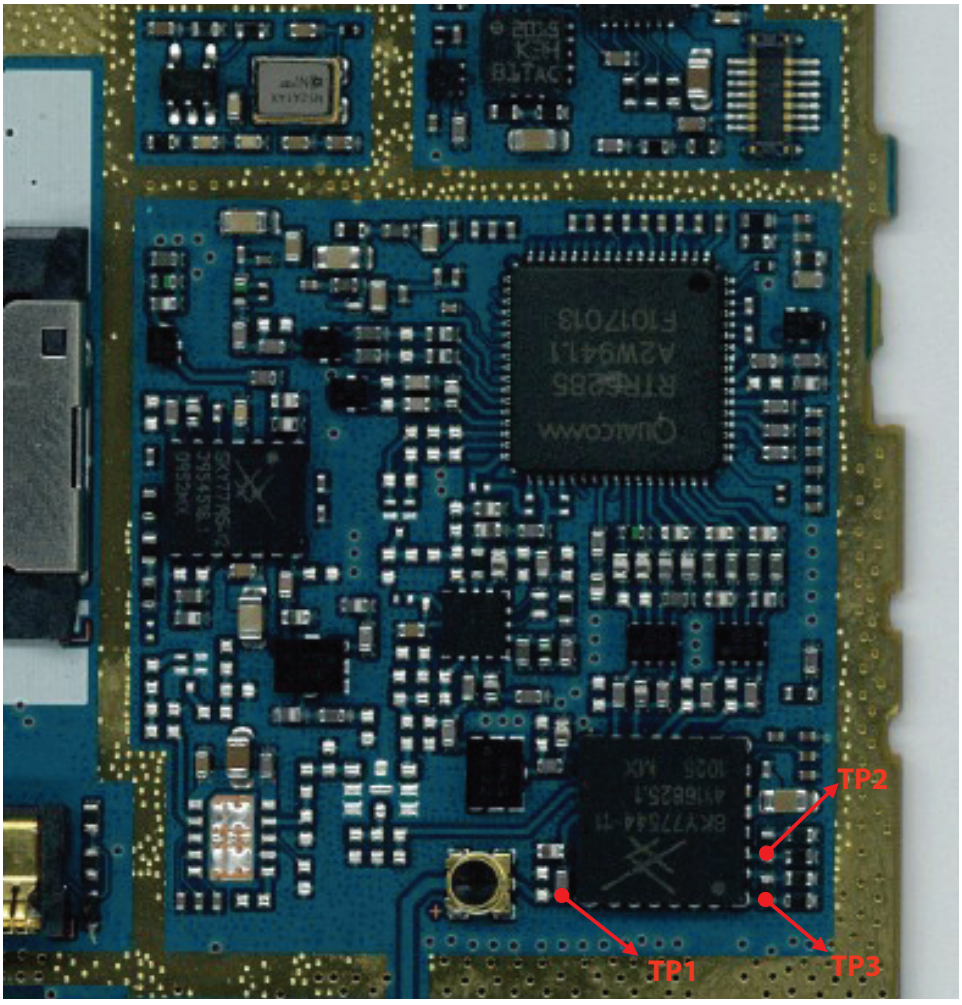
4.6.1 Checking TCXO Block

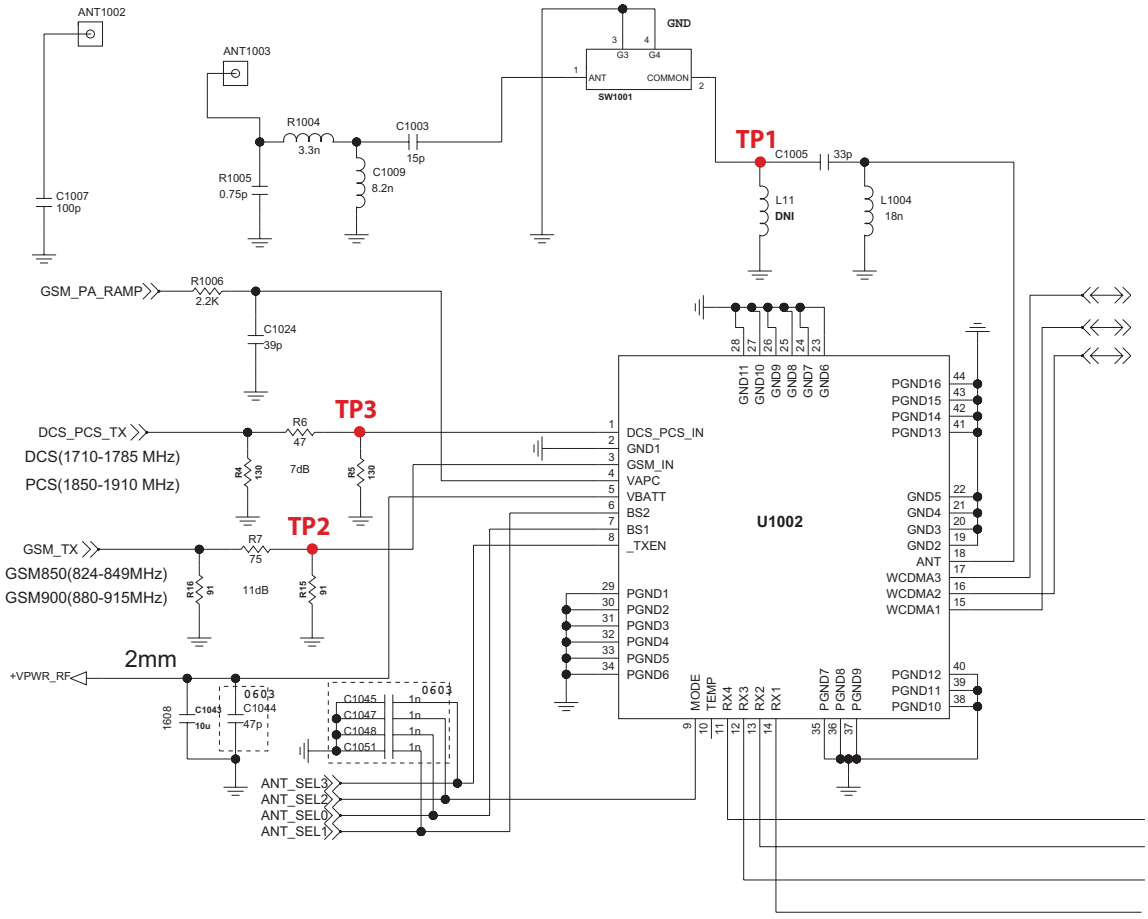
Refer to 1.3

4.6.2 Checking FEM Block

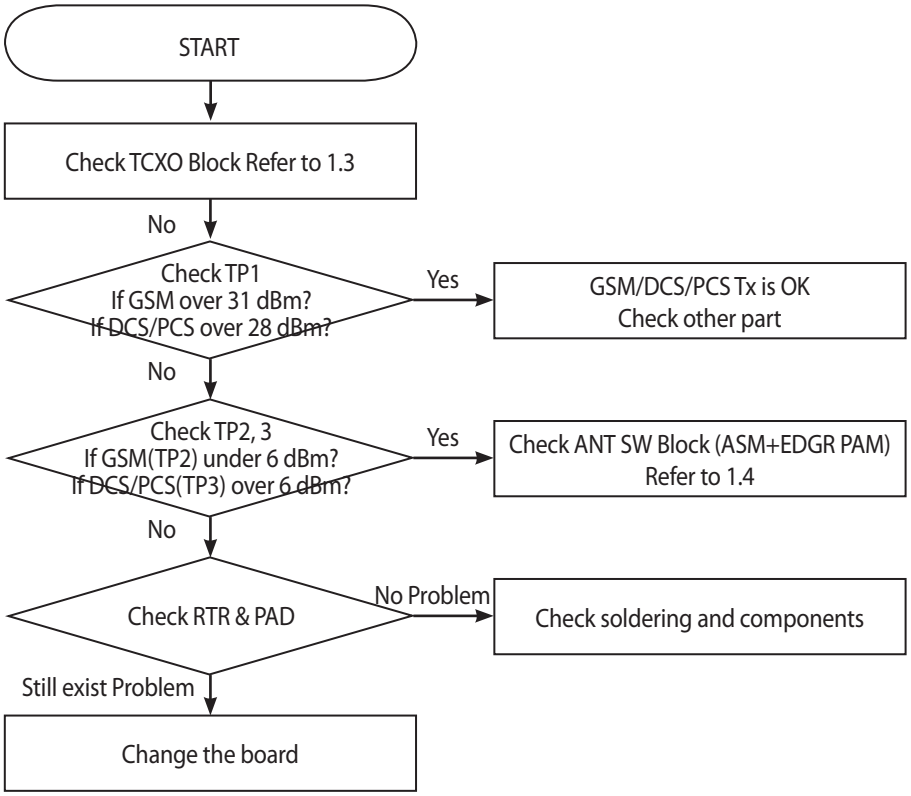
Refer to 1.4

4.6.3 Checking RF TX level

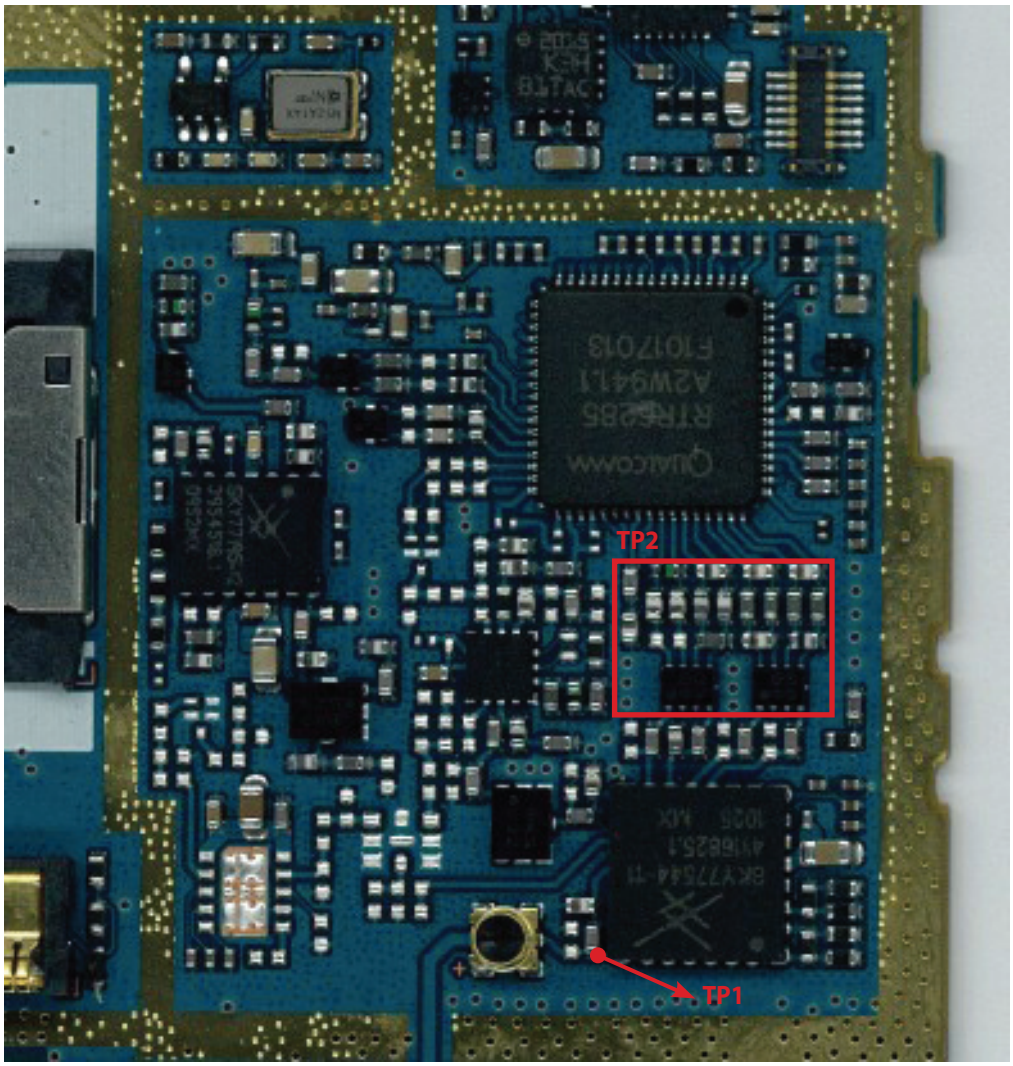


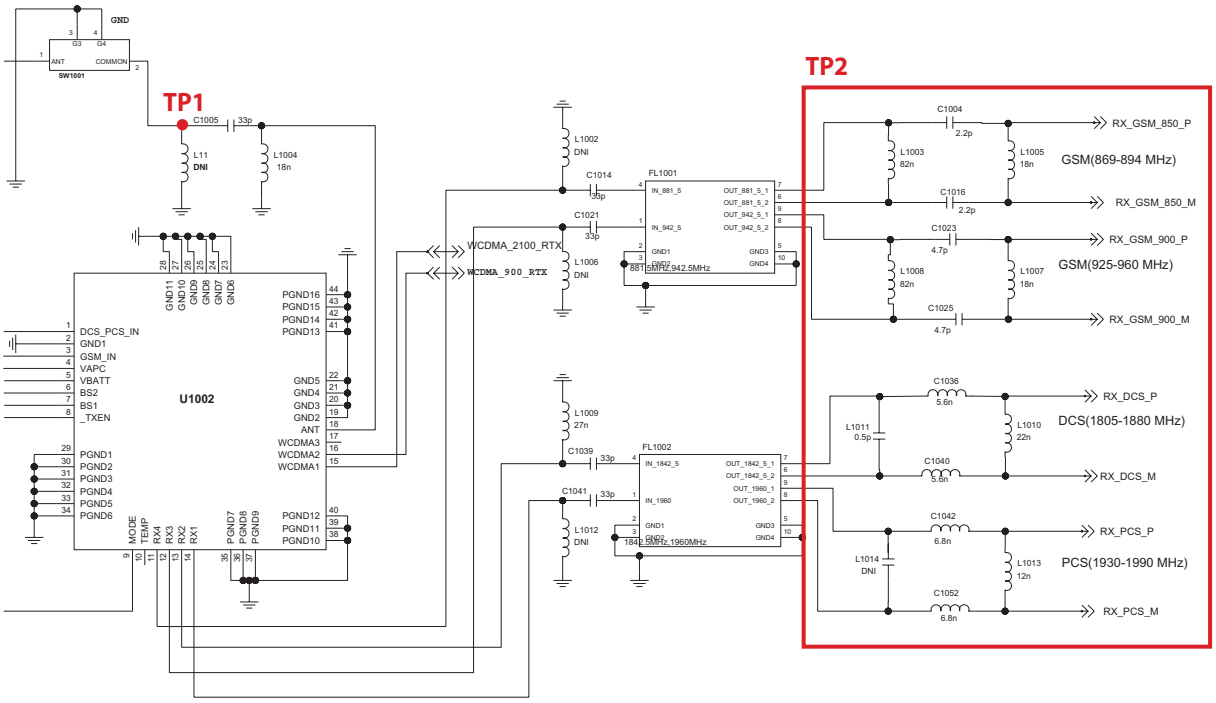


Schematic of GSM/DCS/PCS Tx Block

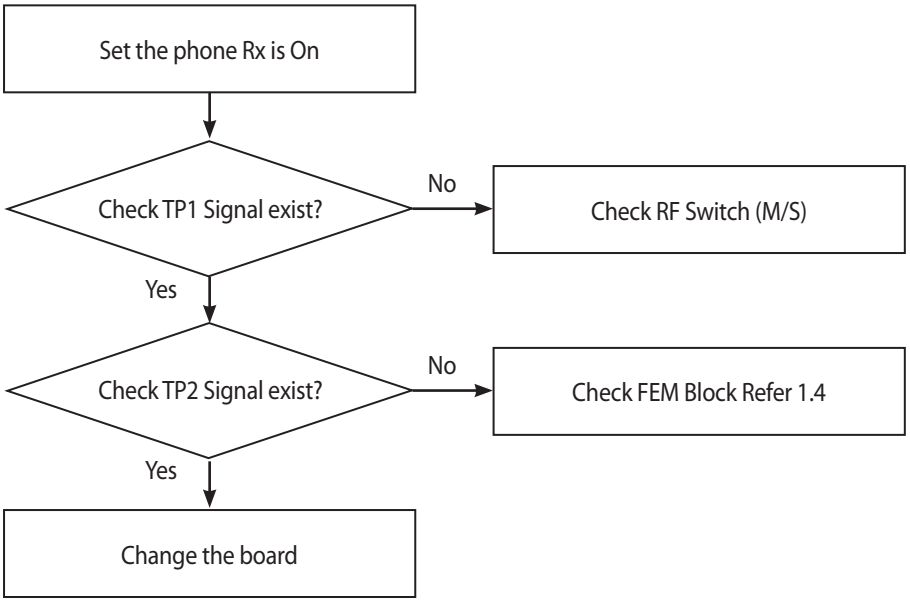


4.6.4 Checking RF Rx Block

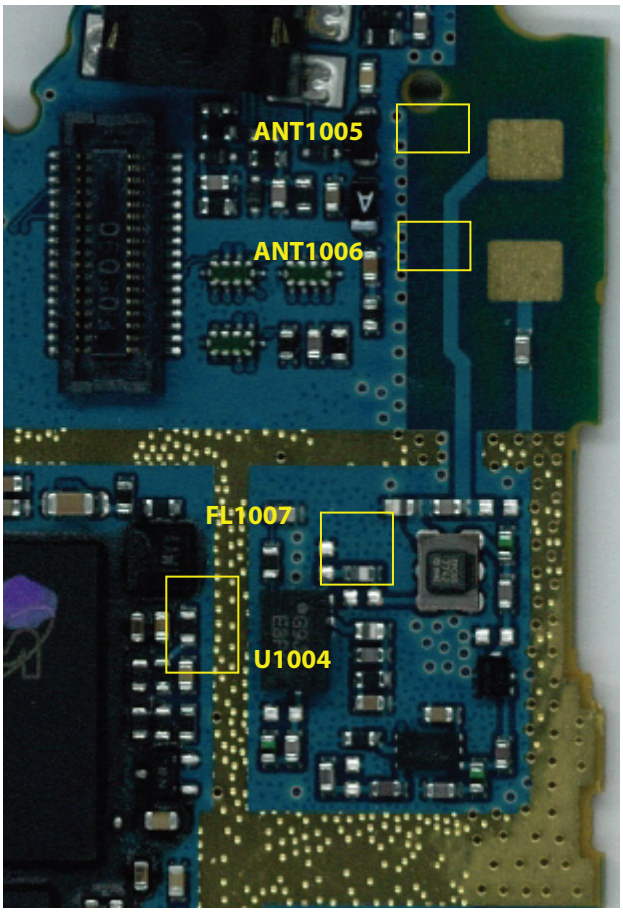




Schematic of GSM/DCS/PCS Rx Block

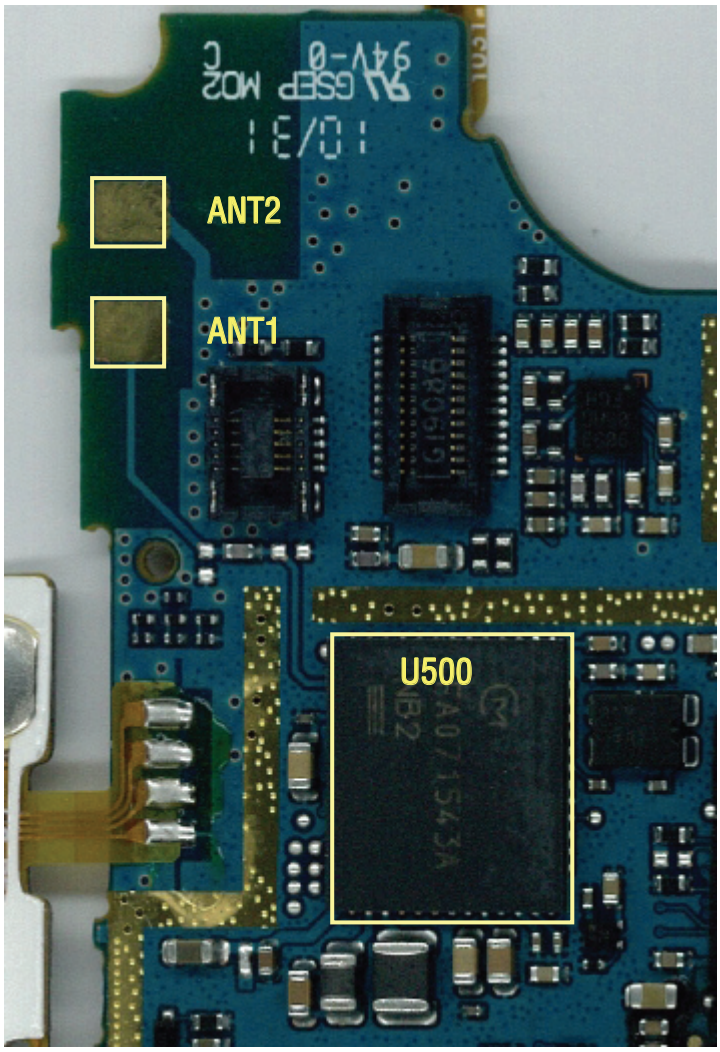


4.7 GPS/WIFI/BT RF Component



RF Component(GPS)

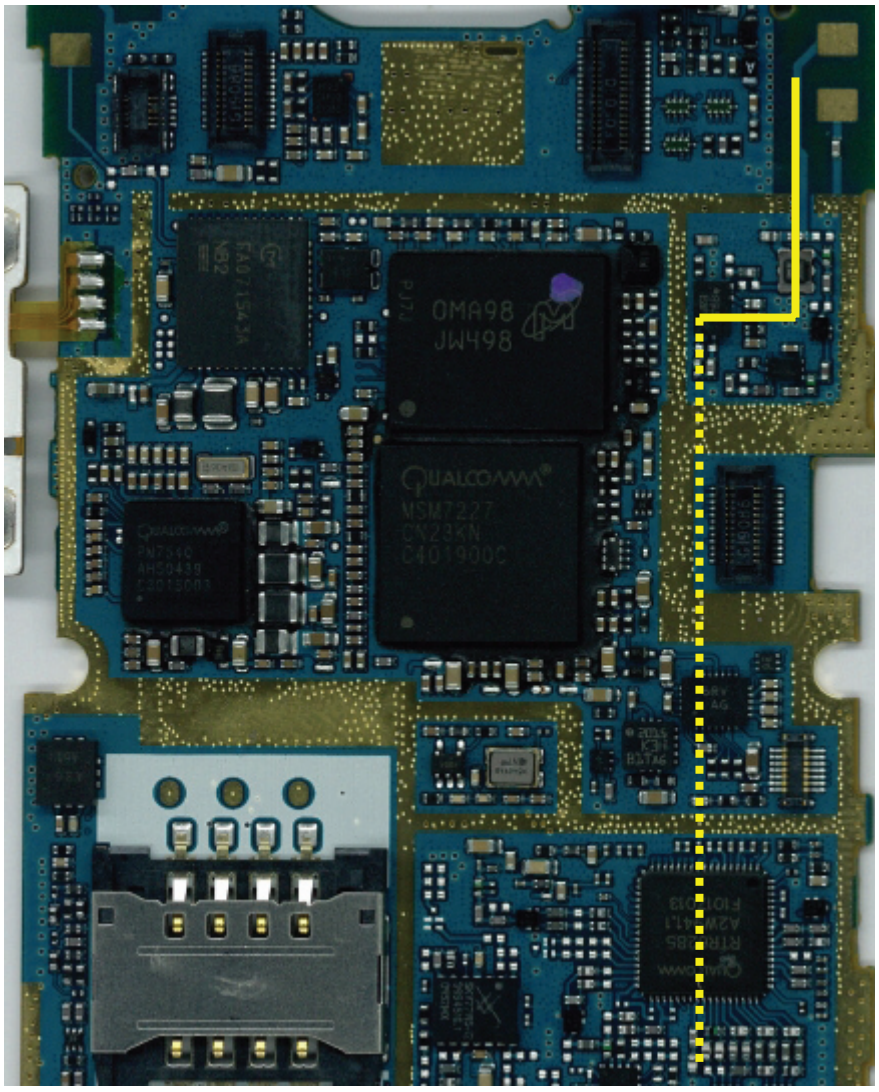
Reference	Description
ANT1005	ANTENNA PAD connected to Carrier type antenna
ANT1006	GND PAD
FL1007	GPS SAW FILTER
U1004	GPS LNA



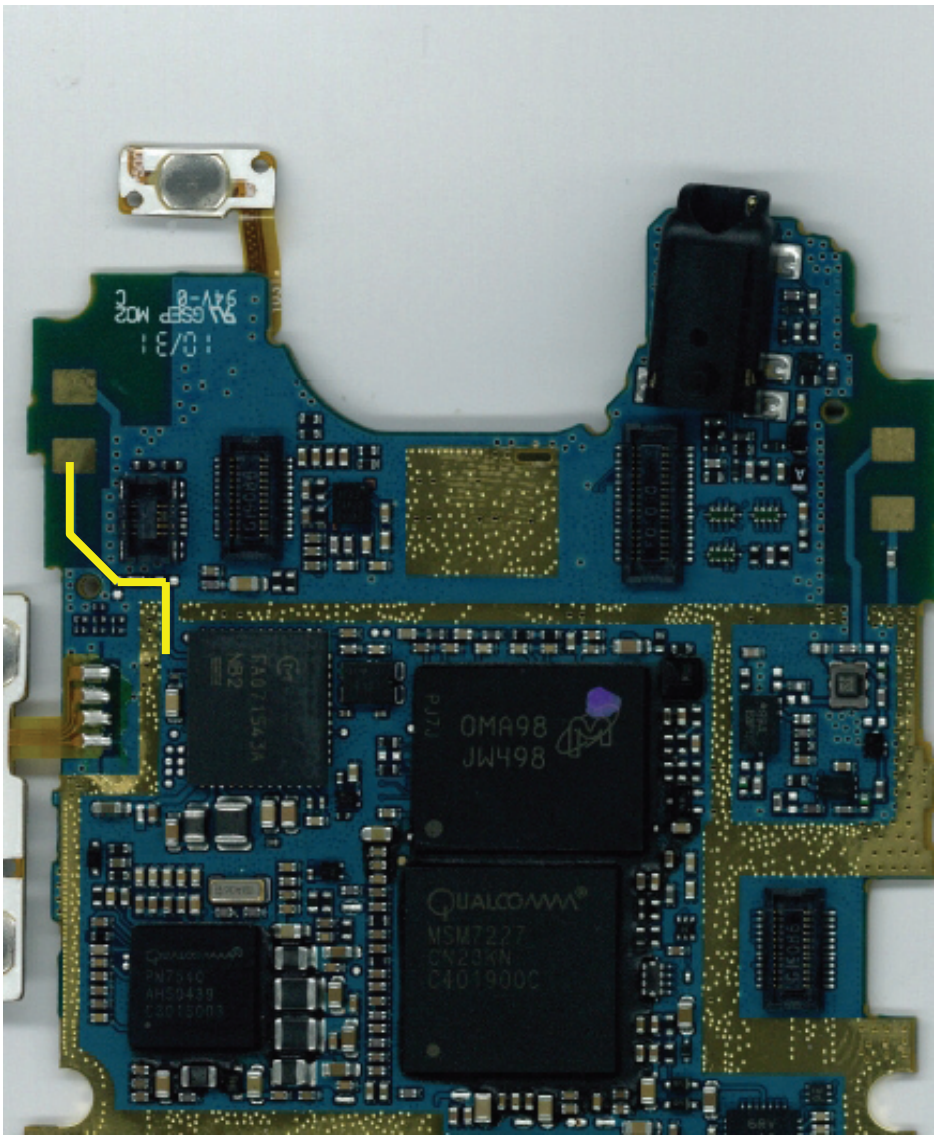
RF component (WiFi / BT)

Reference	Description
ANT1	ANTENNA PAD connected to Carrier type antenna
ANT2	GND PAD
U500	WiFi / BT module

4.8 GPS/WIFI/BT SIGNAL PATH



GPS Signal PATH (main board bottom)

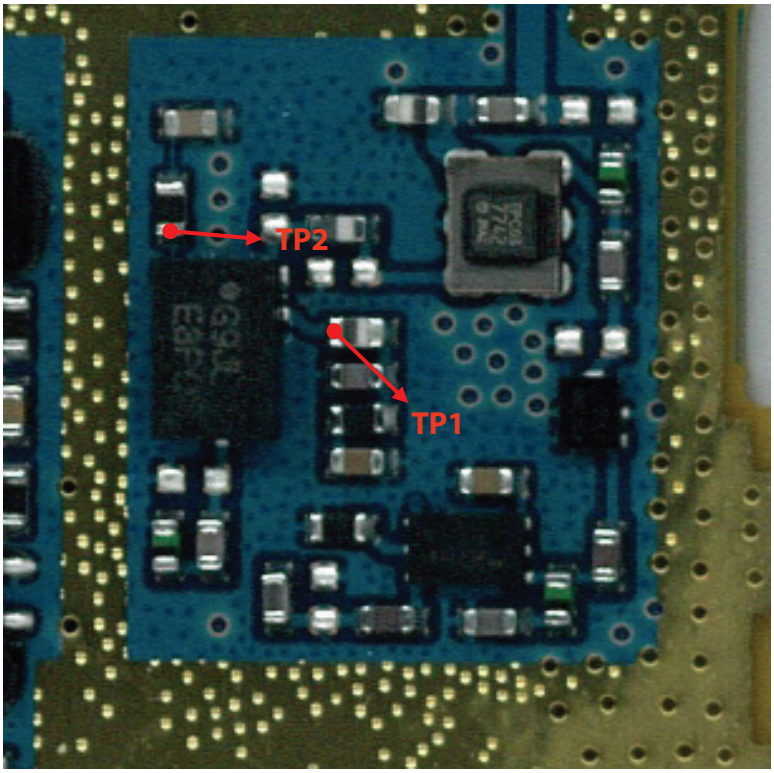


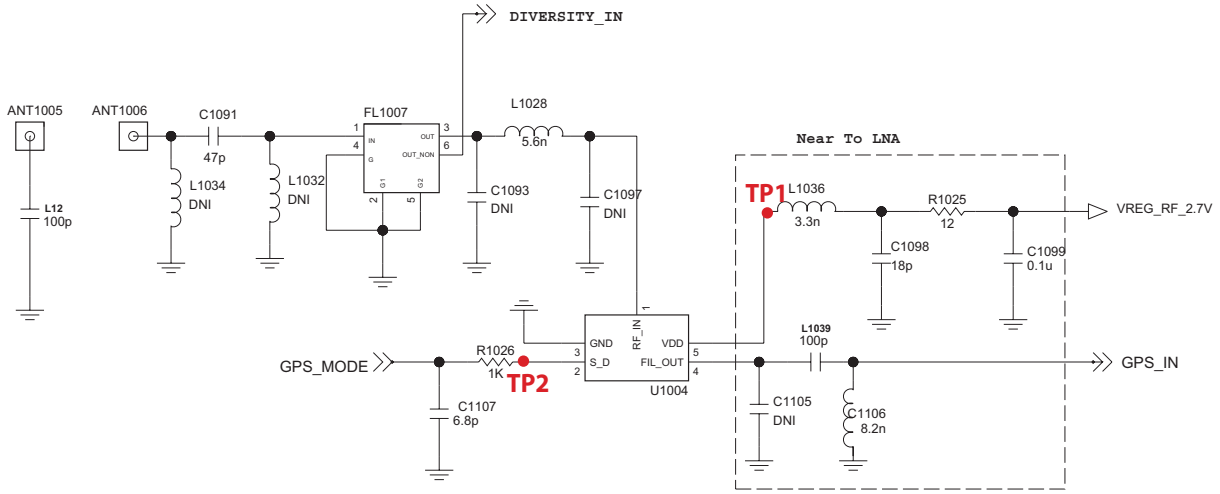
WiFi / BT Signal PATH

WiFi / BT Tx and Rx PATH

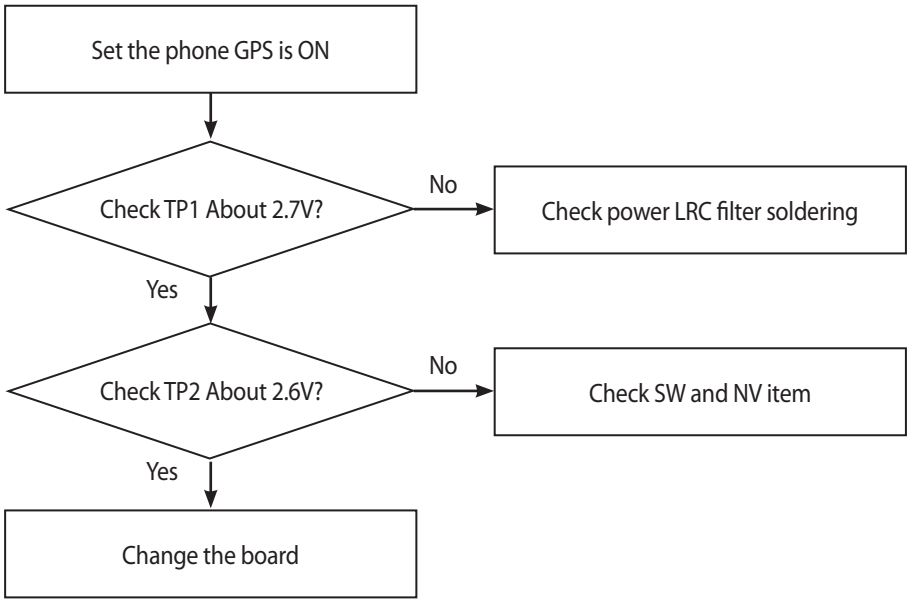
4.9 GPS/WIFI/BT Trouble shooting

4.9.1 A-GPS Block

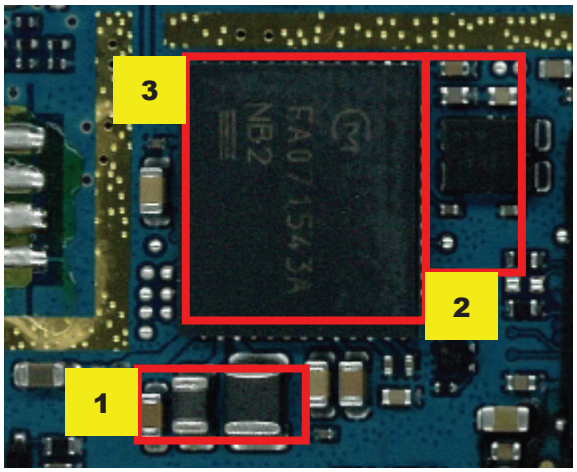


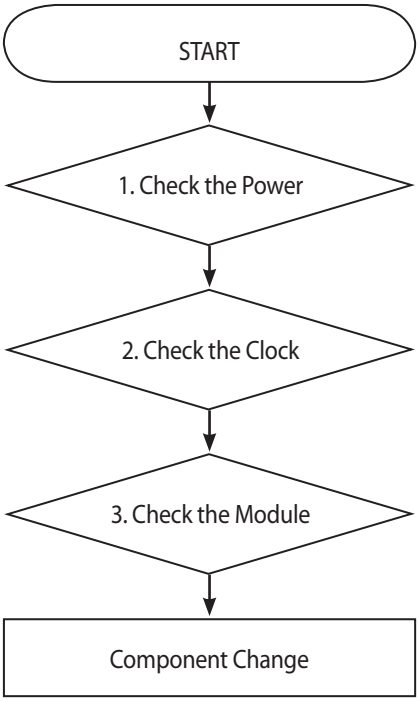


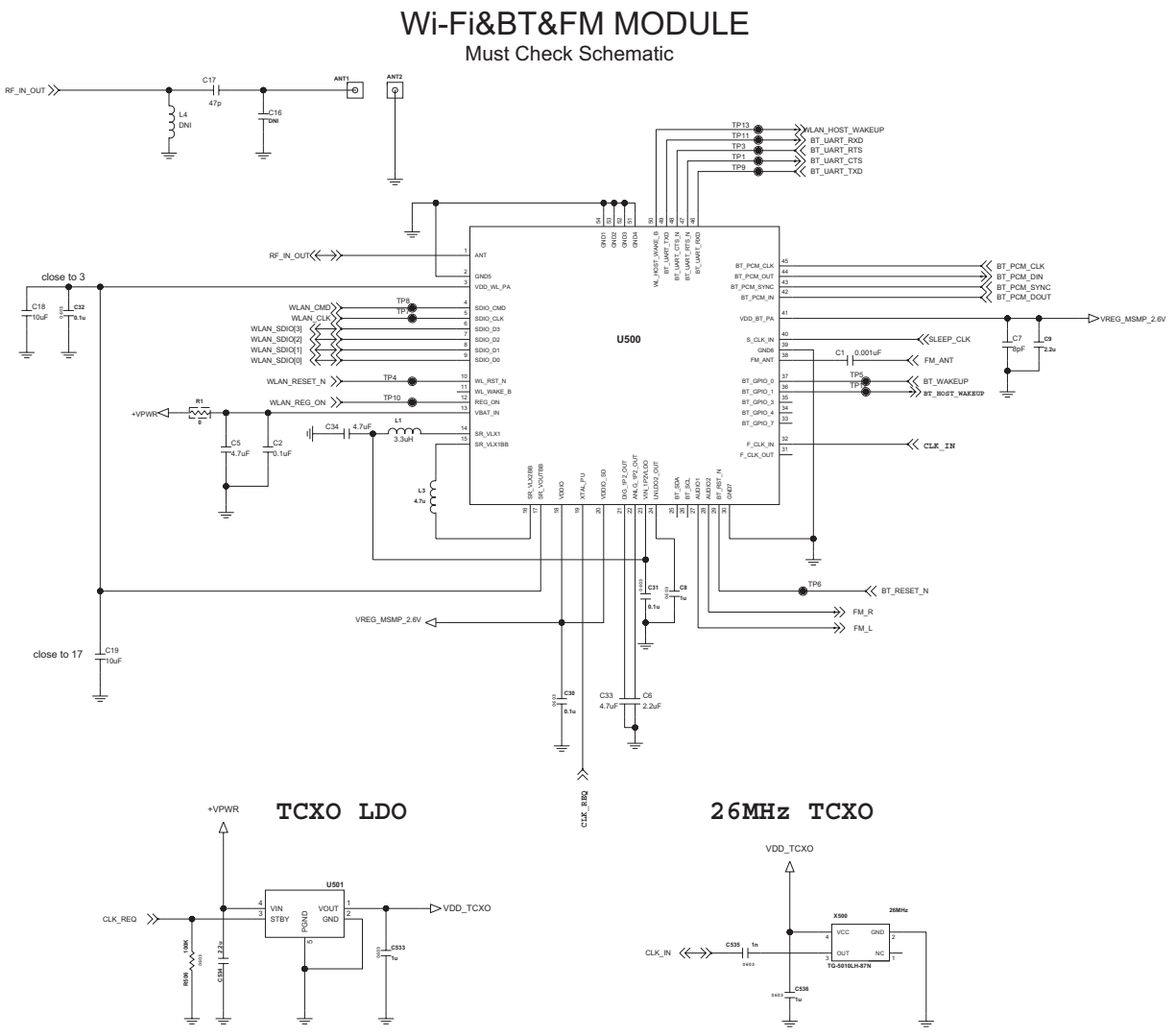
Schematic of the A-GPS block



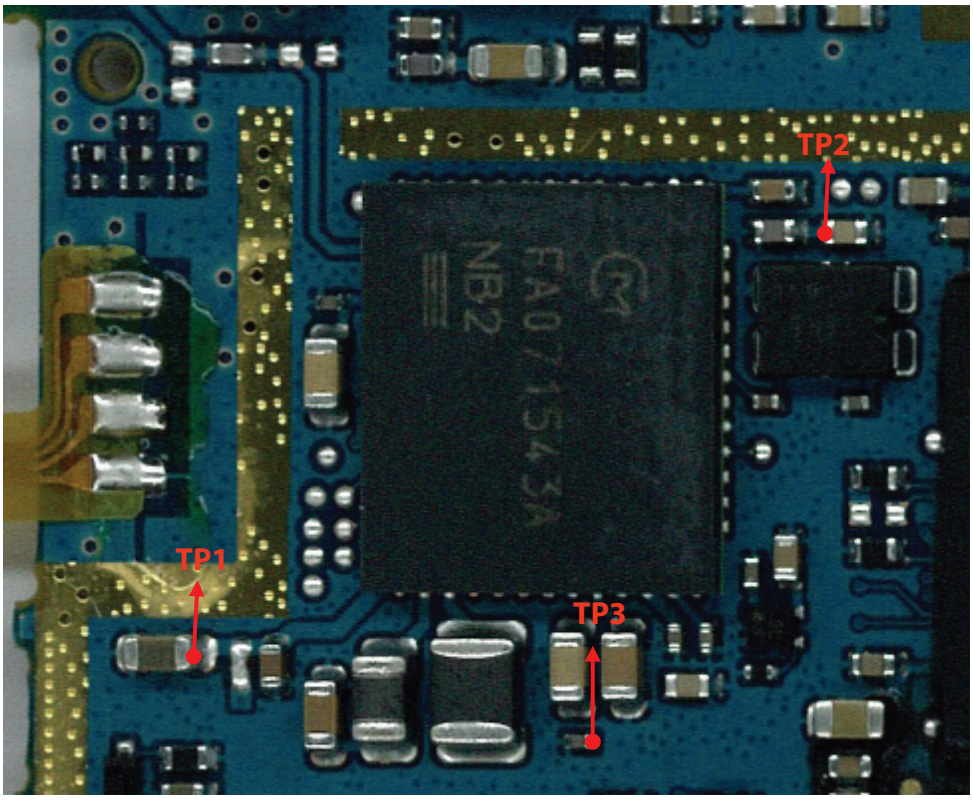
4.9.2 WLAN/BT/FM Block





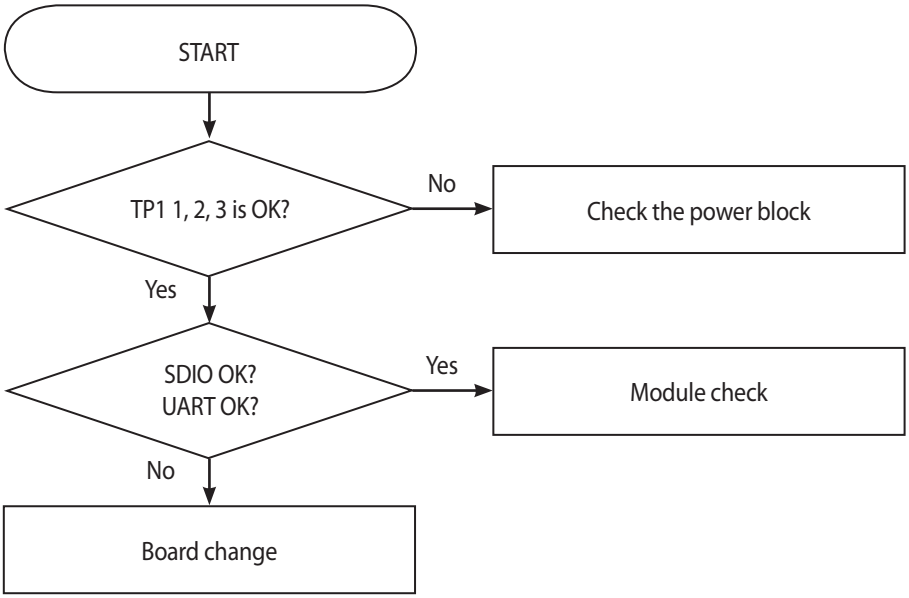


[Figure] Schematic of WiFi/BT module

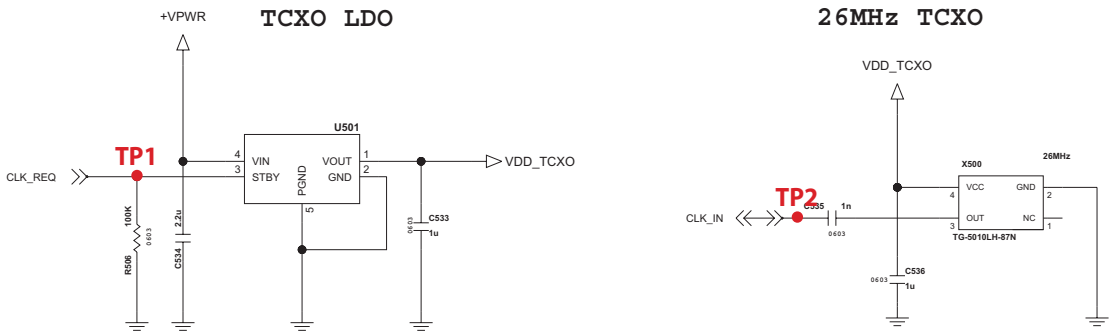


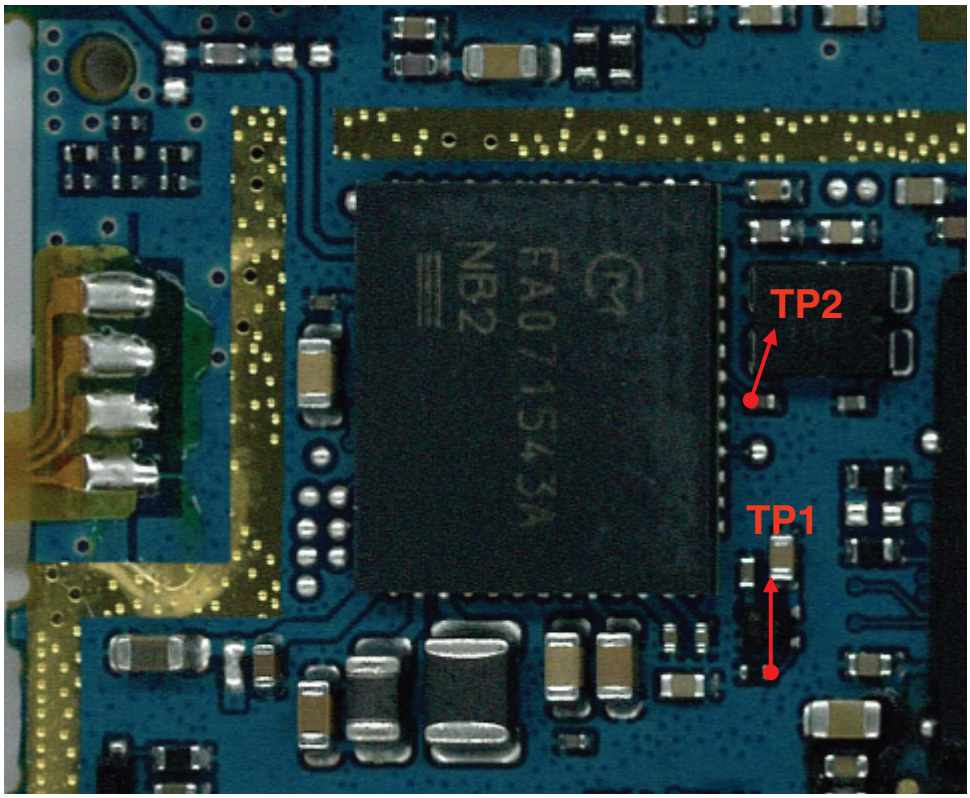
Test point Description

Test point	Net name	Description
TP1	+VPWR	Power for BT/WiFi BB core and WiFi power Amp. (V Batt)
TP2	VREG_MSMP_2.6V	Power for BT power Amp. (2.6V)
TP3	VREG_MSMP_2.6V	Power for host interface (2.6V)



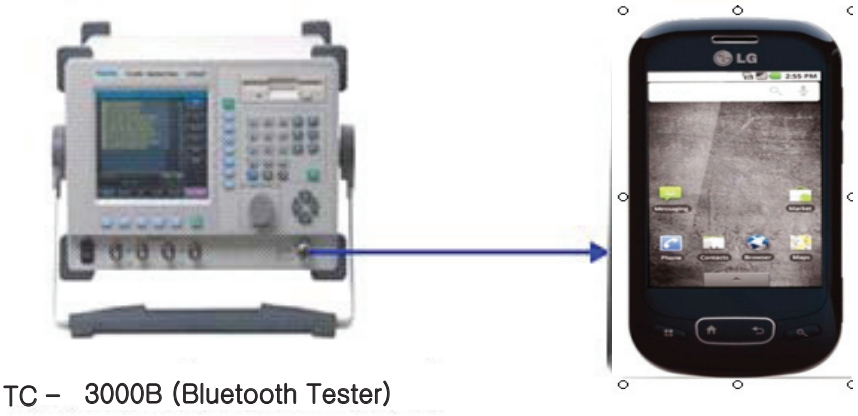
Main clock part





Test Point	Net name	Description
TP1	CLK_REQ	On/Off Control external clock source 0 : TCXO off 1 : TCXO on
TP2	**CLK_IN**	TCXO outp ut clock : 26MHz

Test Point of TCXO



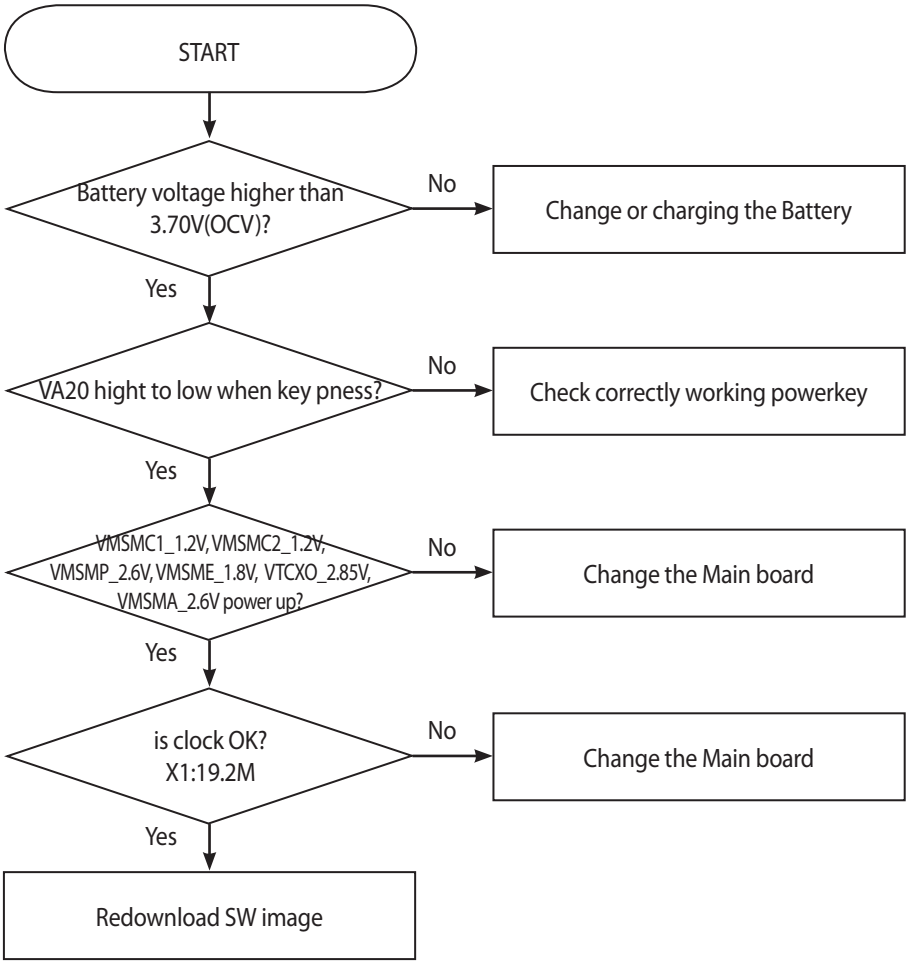
- Bluetooth RF Test procedure

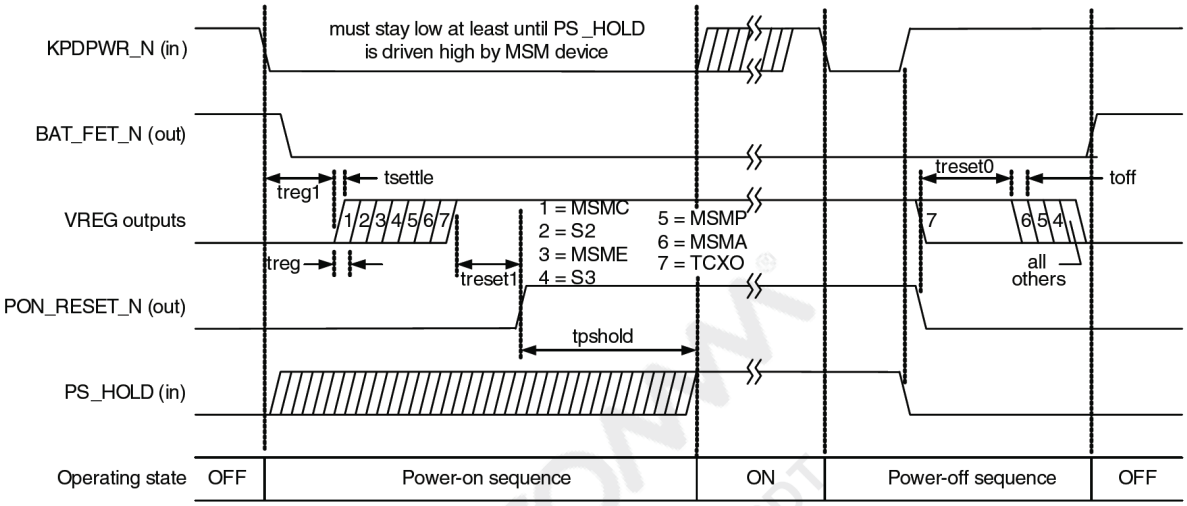
1. Set phone to Bluetooth test-mode.
- Blue tooth ON: Enter Test Mode(277634#*#) → Module test set → BT DUT → BT DUT ON
2. Insert a phone in a TEMCELL (in case of radiation test)
3. Set 'discover' after push menu button of the tester and select the link analyzer.
4. After 'set test mode', confirm the connection state.
5. Measure the power of full channel after hopping mode is selected to 'ON'
6. You can select wanted test cases after getting an optimized power
7. Blue tooth On/Off
- Menu Key→settings→Wireless controls→Bluetooth→Turn on/Turn off

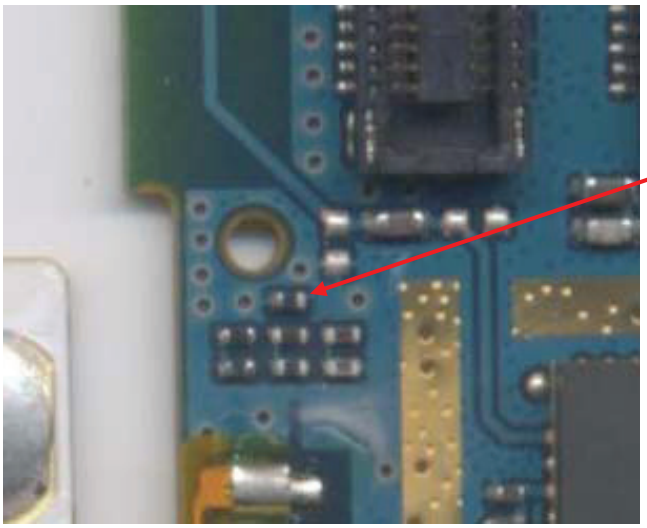
4.10 Power ON Troubleshooting

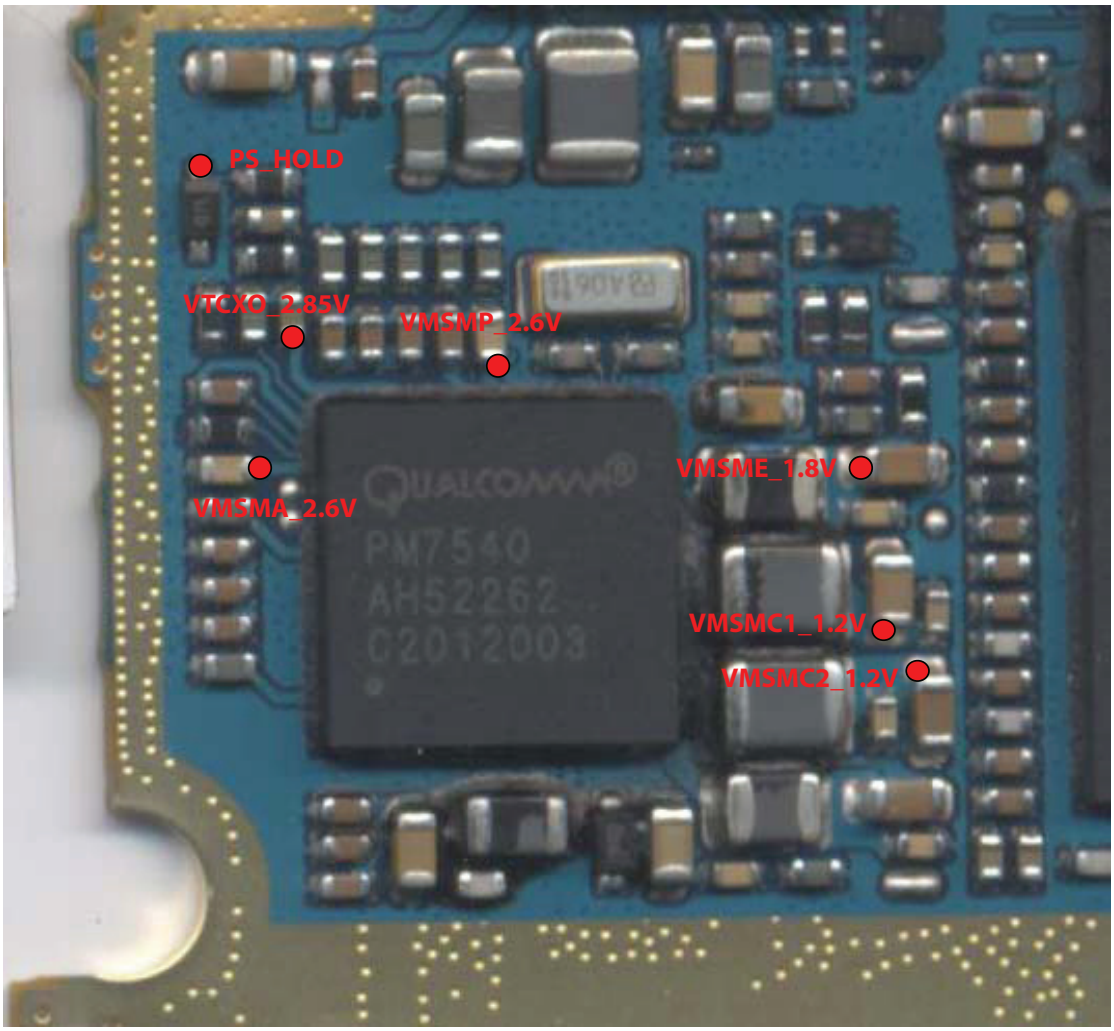
Power On sequence of P500 is :

Power key press → KPD_PWR_N go to low → PM7540 Power Up → VREG_MSMC1_1.2V(C433), VREG_MSMC2_1.2V(C434), VREG_MSME_1.8V(C435), VREG_MSMP_2.7V(C453), VREG_MSMA_2.6V(C452), VREG_TCXO_2.85V(C457) power ON → Phone booting and PS_HOLD(D404) go to High

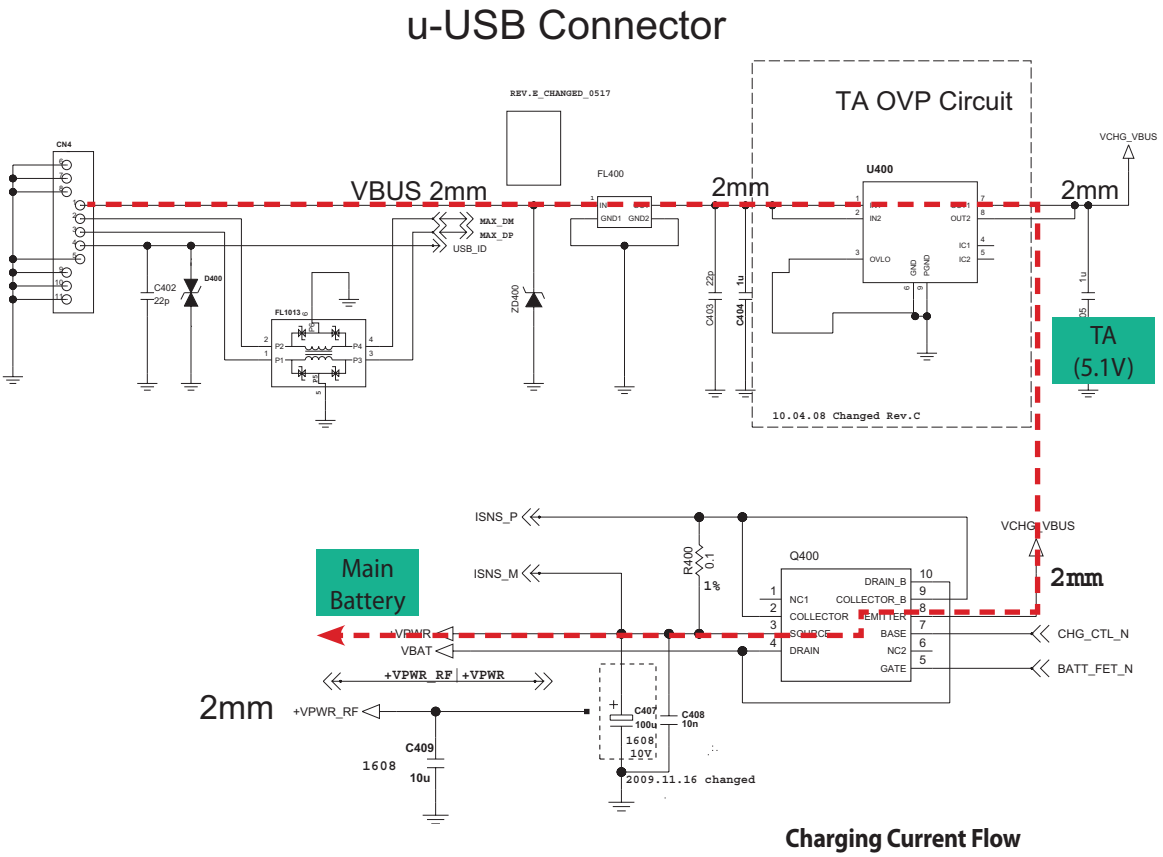








4.11 Charging Trouble shooting



Charging Current Flow

Charging Procedure

- Connect TA or u-USB Cable
- Control the charging current by PM7540 IC
- Charging current flows into the battery

Troubleshooting Setup

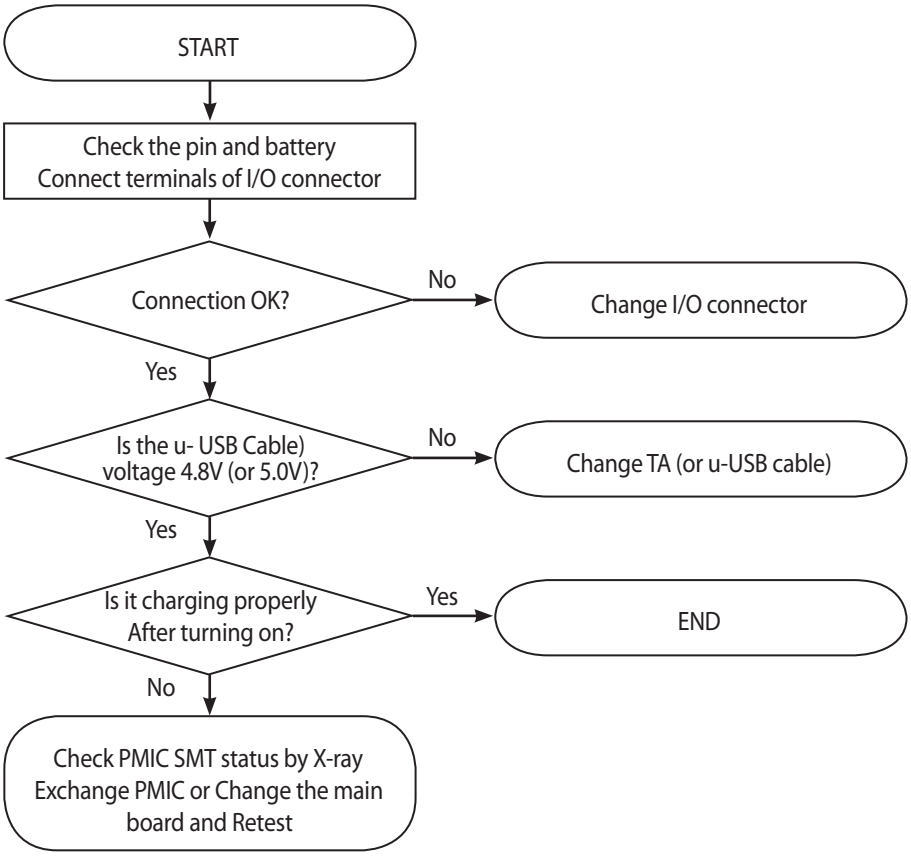
- Connect TA and battery to the phone

Check Point

- Connection of TA or USB Cable
- Charging current path(NUS5530MIN)
- Battery

Troubleshooting Procedure

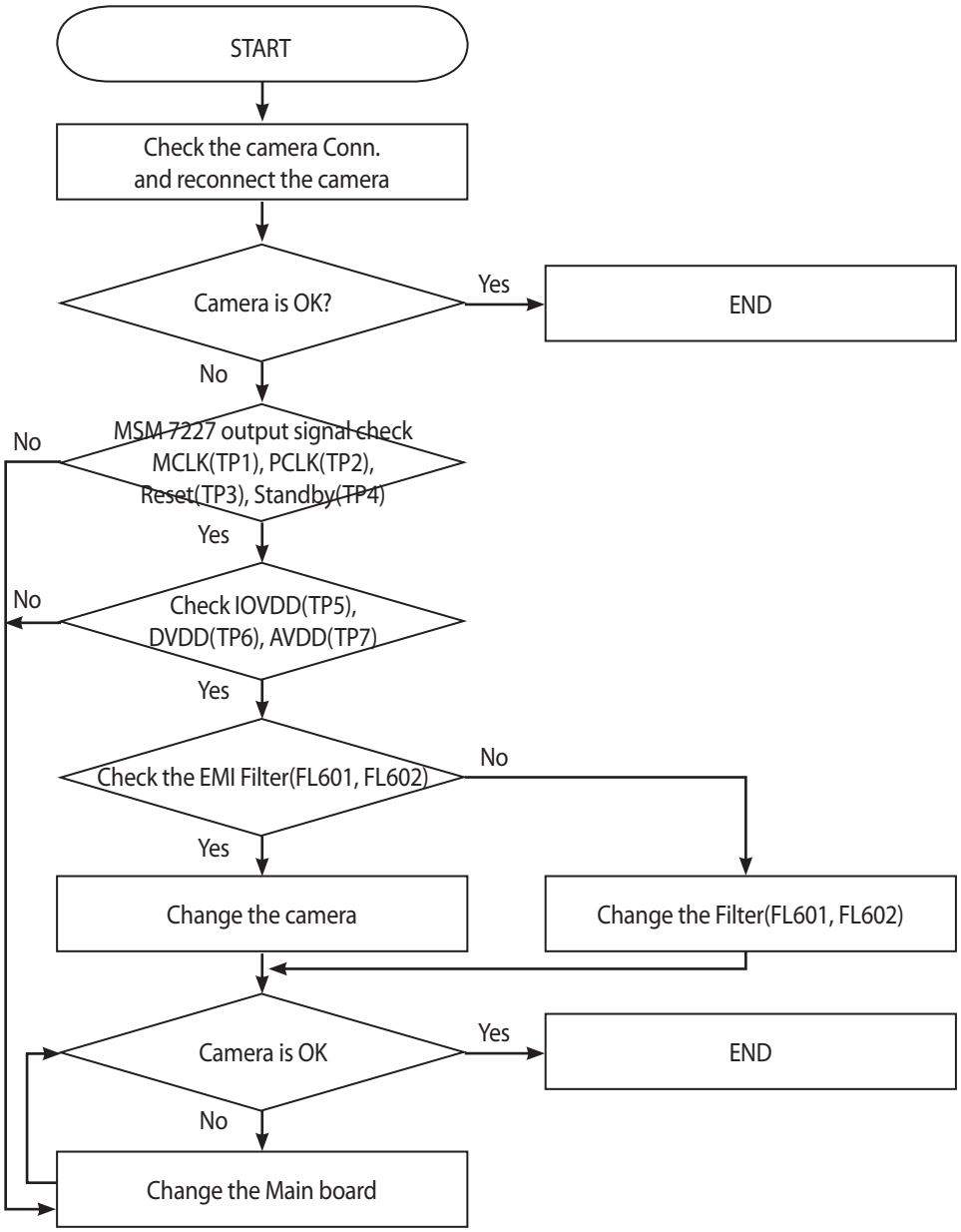
- Check the charger (TA or USB Cable) connector
- Check the OVP Circuit
- Check the charging current Path
- Check the battery

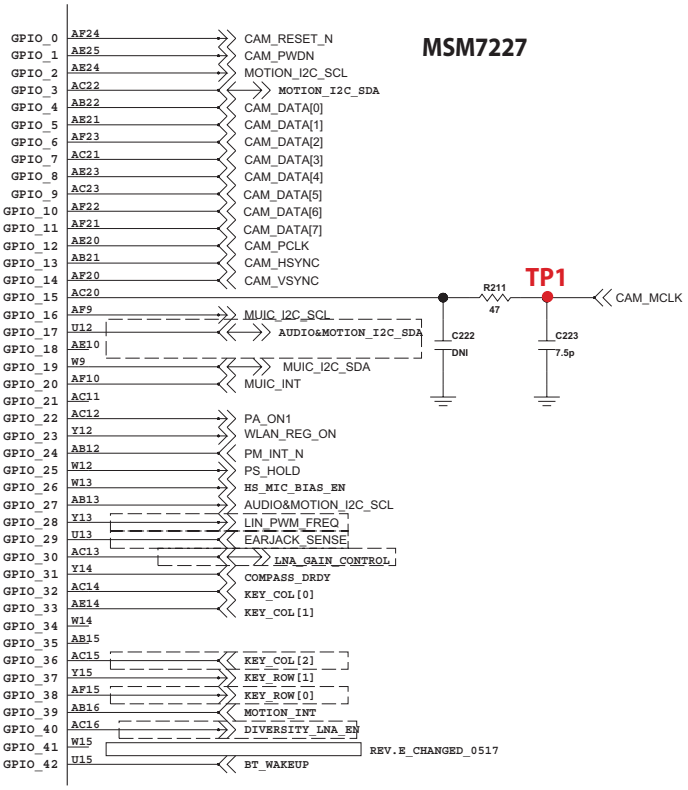


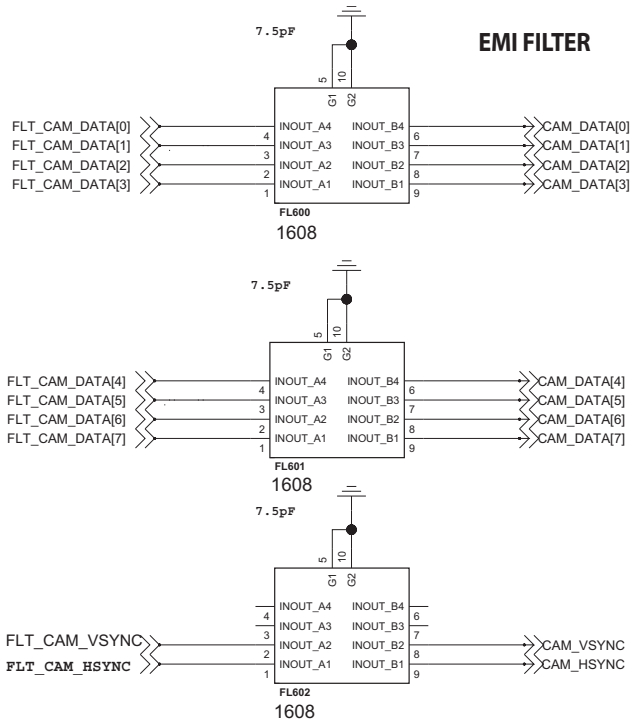
Charger Troubleshooting Flow

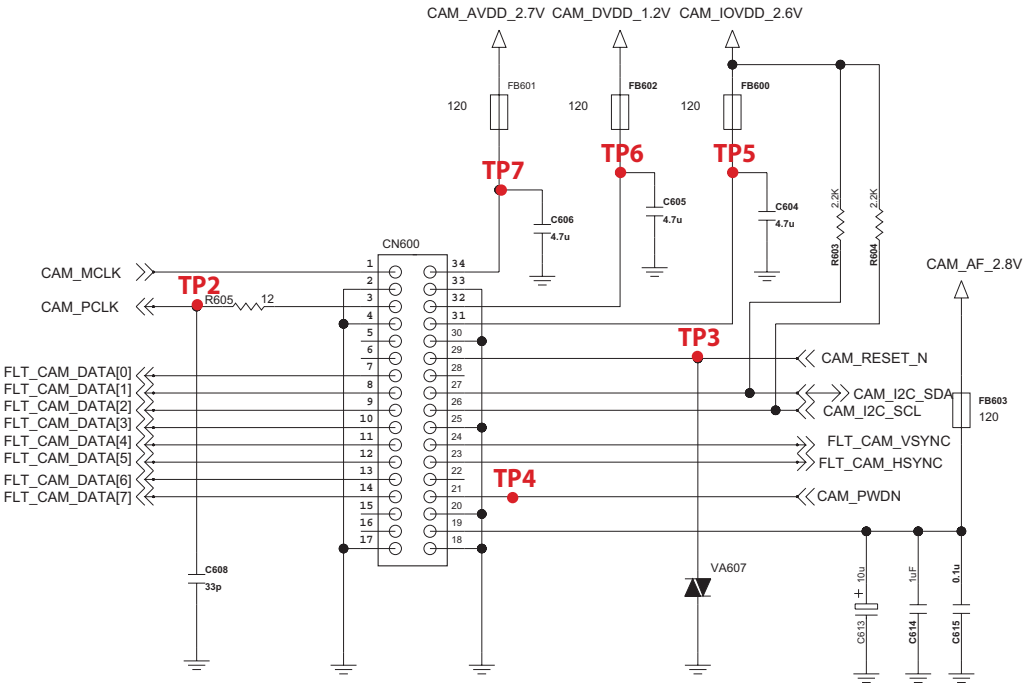
4. 12 3M AF Camera trouble

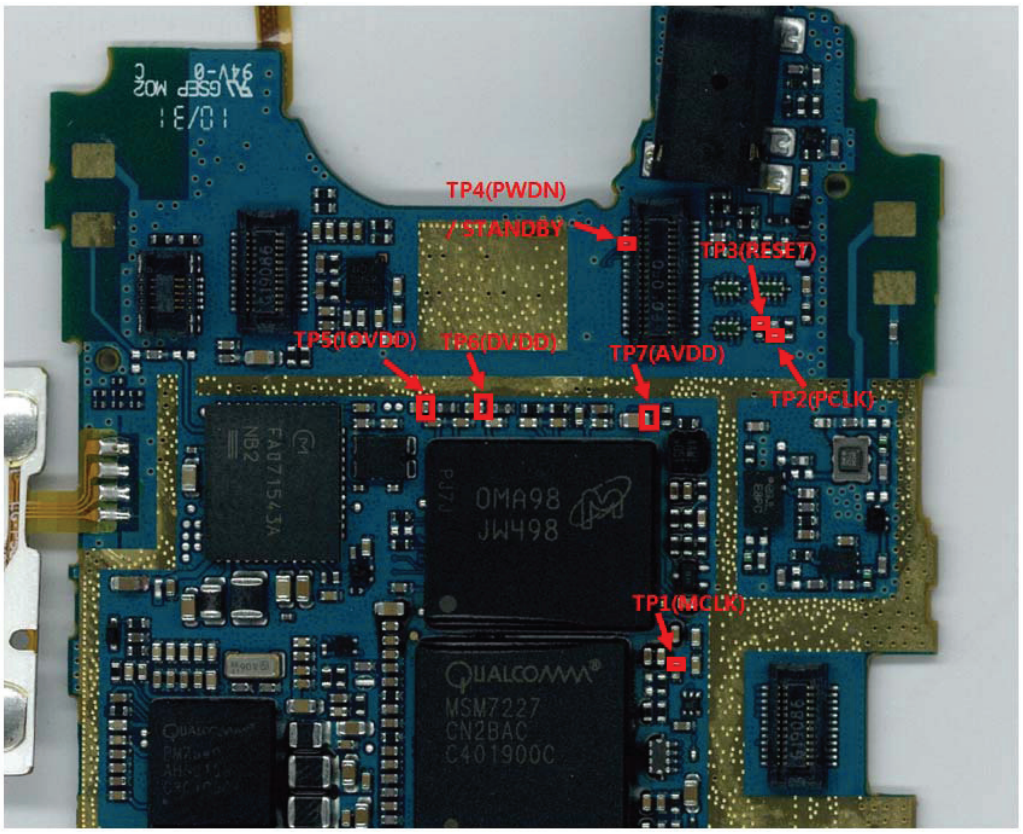
3M camera control signals are generated by ISX005 and MSM7227.







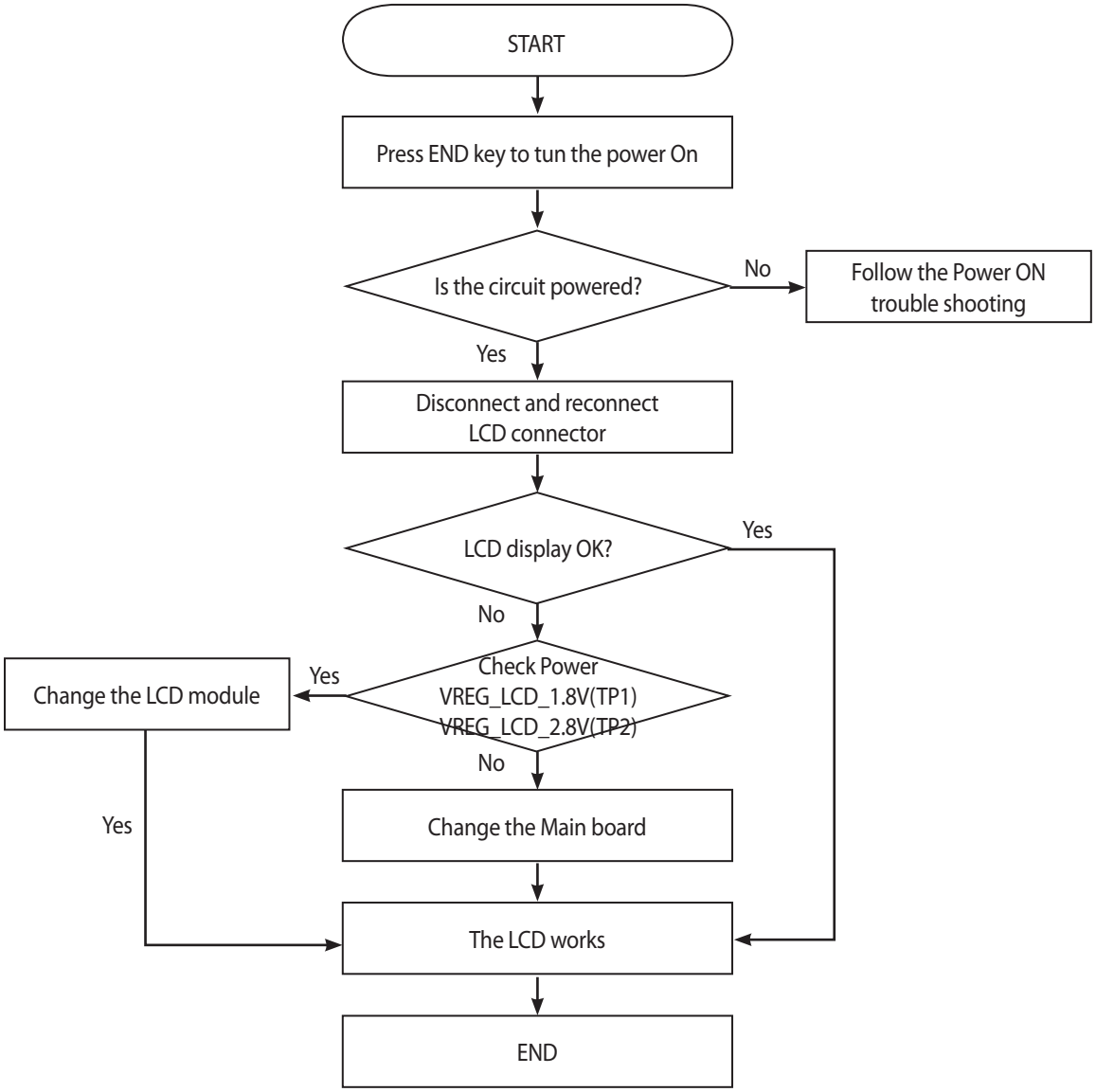




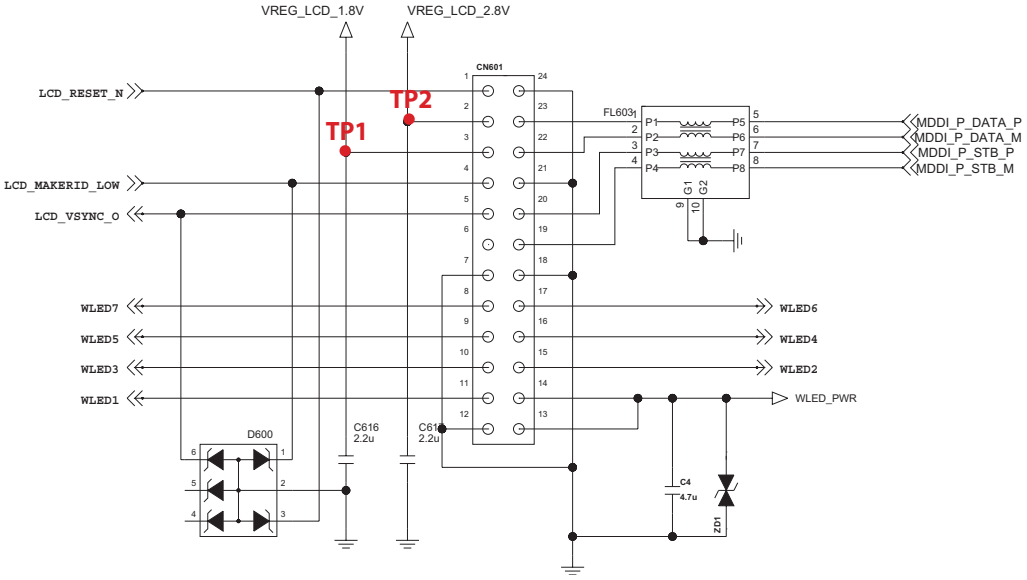
4. 13 Main LCD trouble

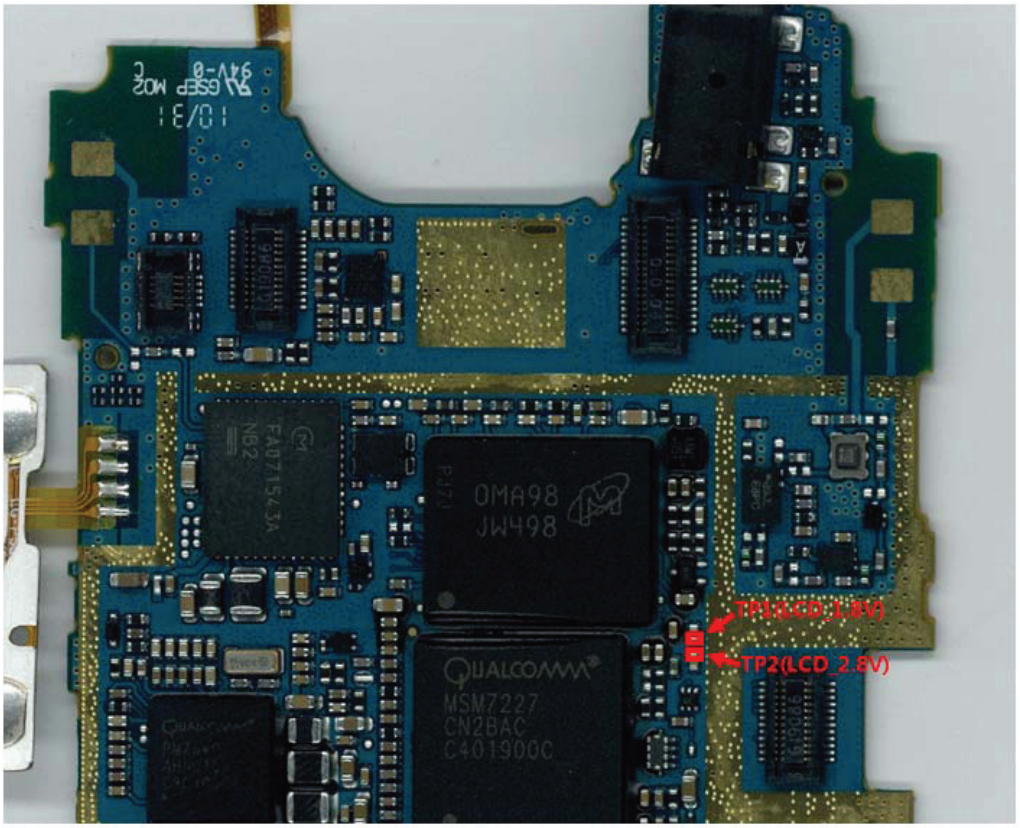
Main LCD control signals are generated by MSM7227. Those signal's path are :

MSM7227 -> LCD Module



3.2" HVGA LCD Connector



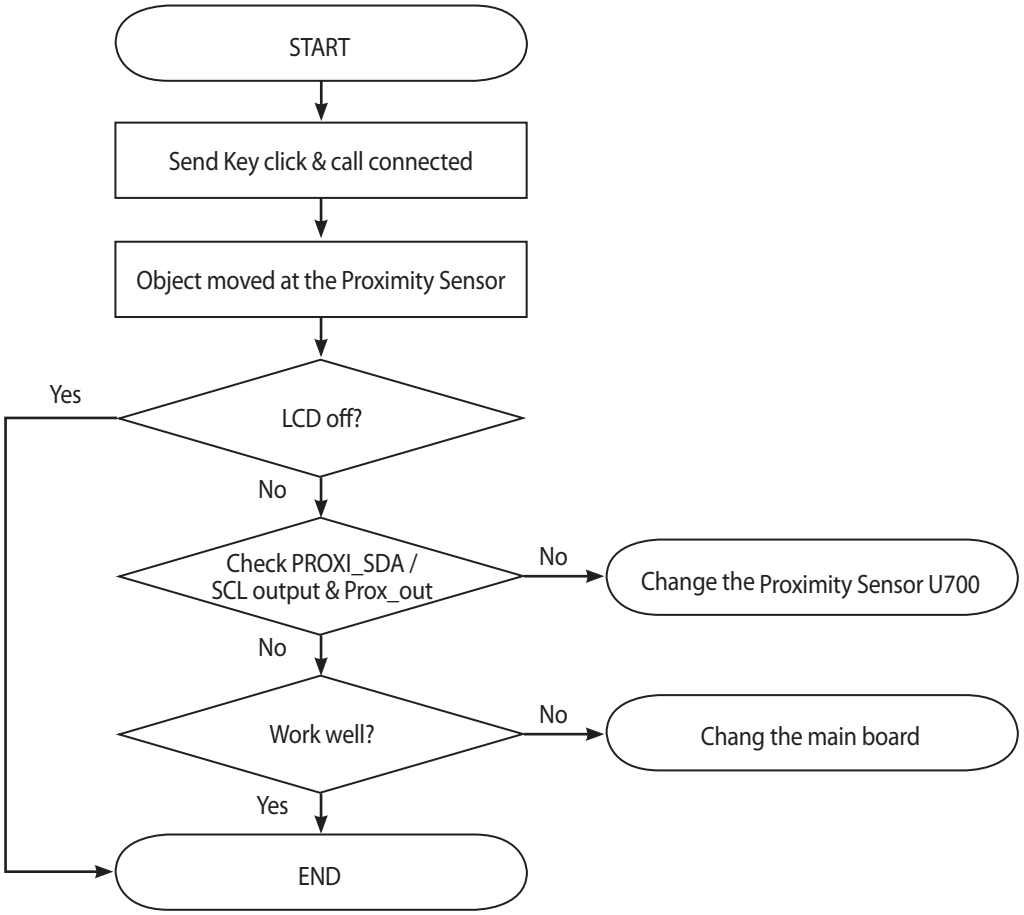


4.14 Proximity Sensor on/off trouble

Proximity Sensor is worked as below :

Send Key click ➔ Phone number click ➔ Call connected ➔ Object moved at the sensor

➔ Control the screen's on/off operation automatically



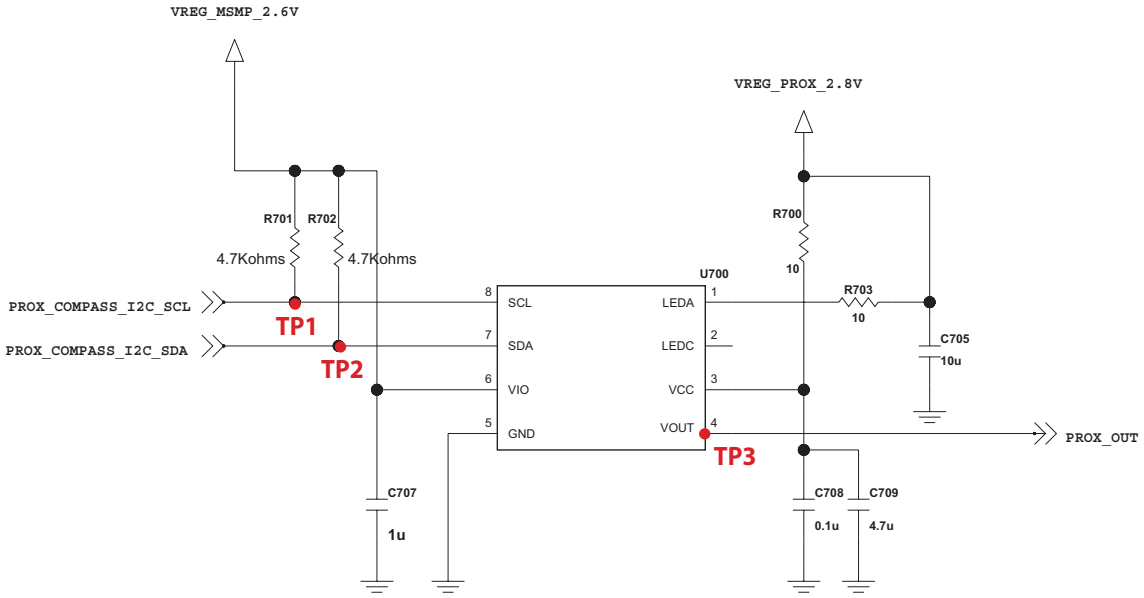
Measurement

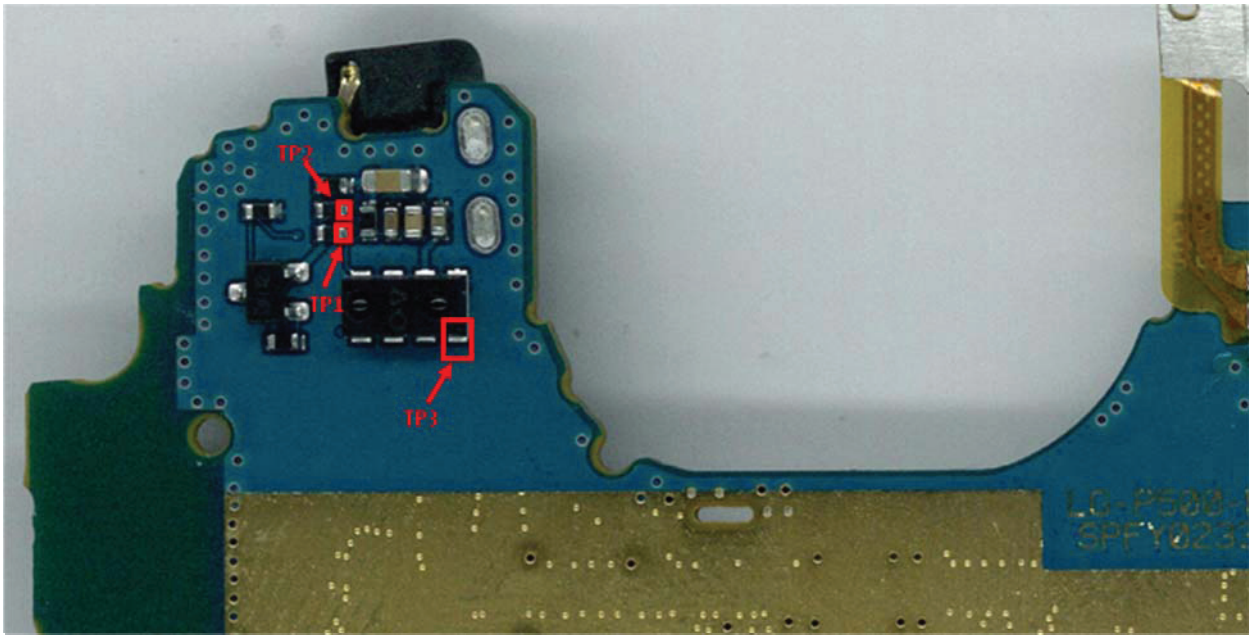
VREG_MSMP_2.6V

VREG_PROX_2.6V

PROX_OUT

PROX_COMPASS_I2C_SCL / SDA

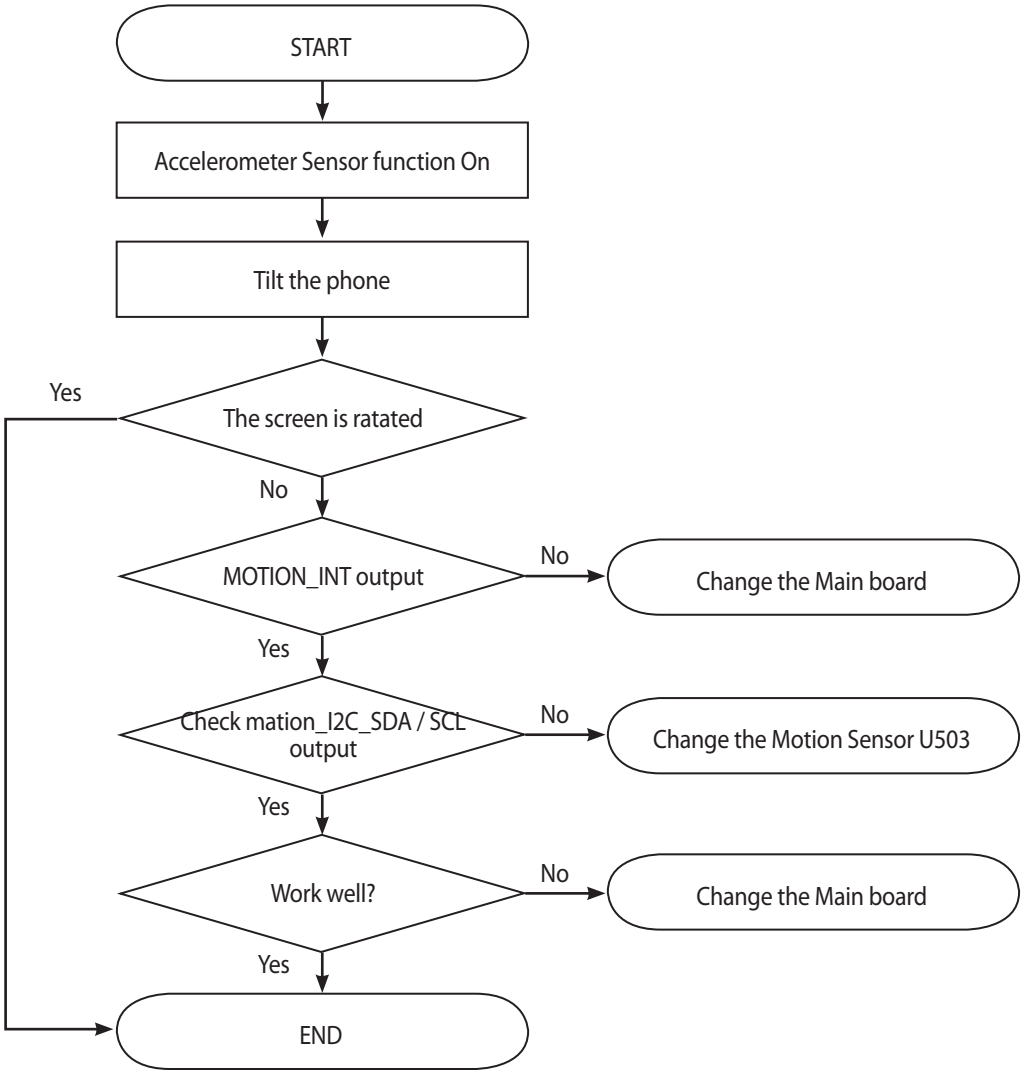




4.15 Motion Sensor on/off trouble

Motion Sensor is worked as below :

Accelerometer Sensor function On ➔ Tilt the phone (90˚) ➔ The screen is had rotated automatically.

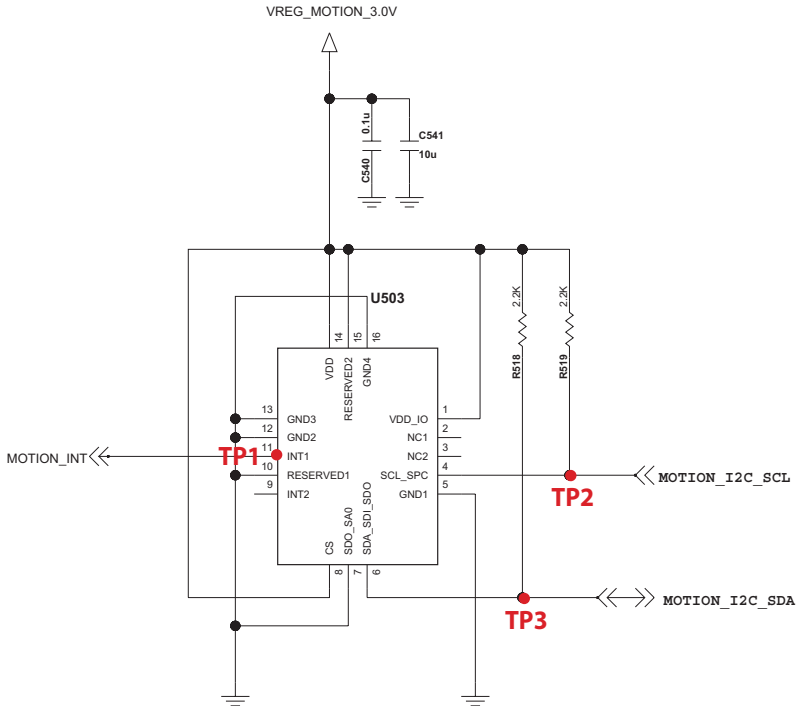


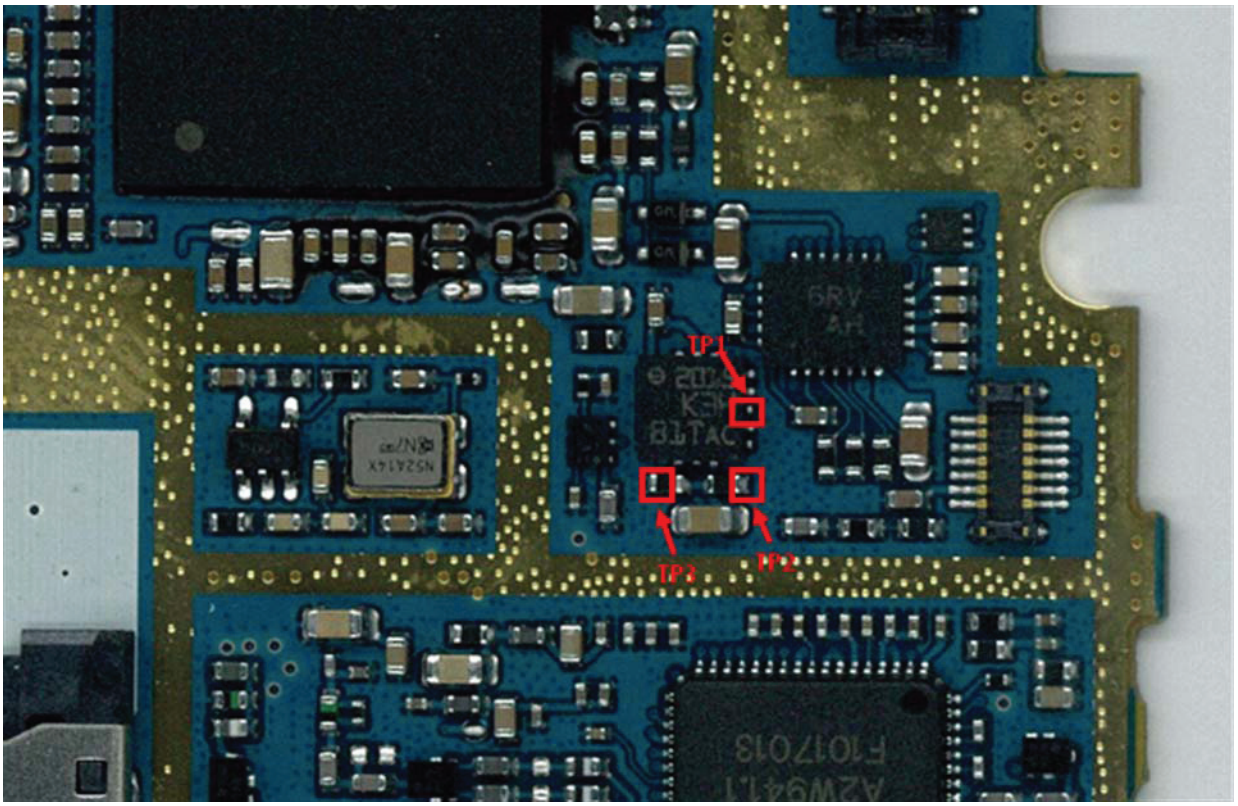
Measurement

VREG_MSMP_3.0V

MOTION_INT

MOTION_I2C_SDA / SCL

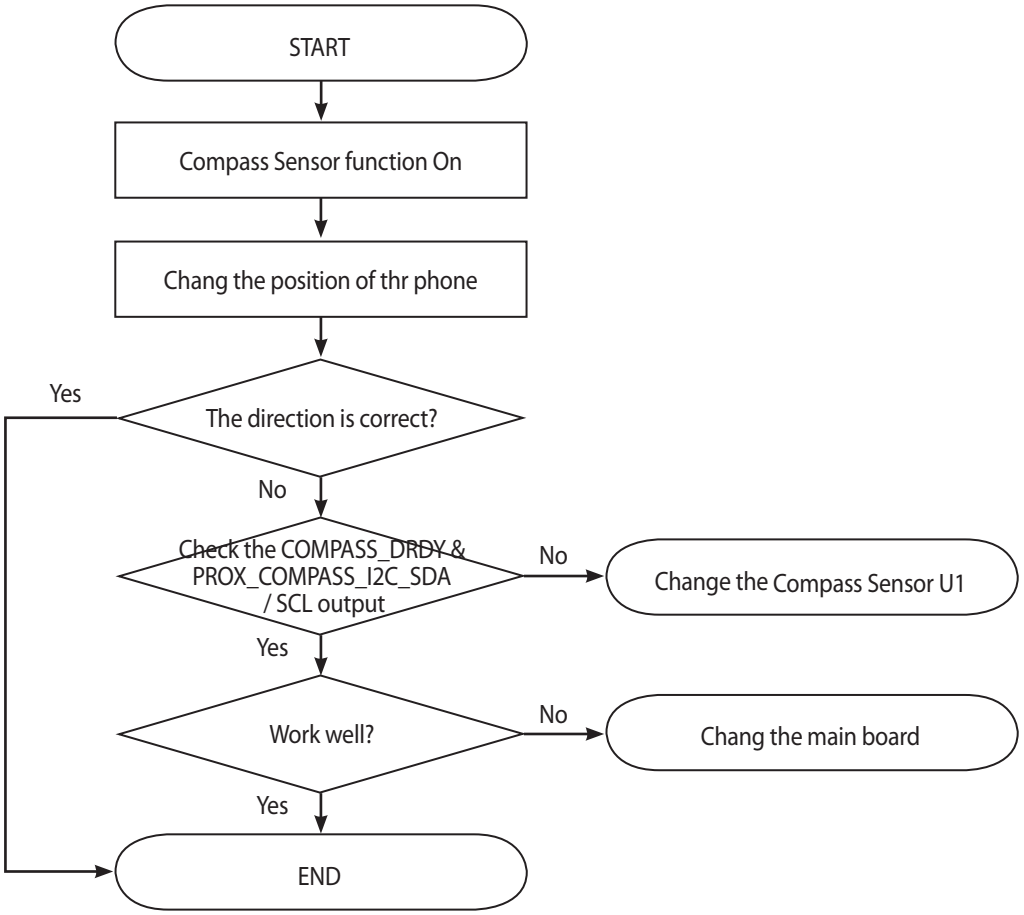




4.16 Compass Sensor on/off trouble

Compass Sensor is worked as below :

Compass Sensor function On



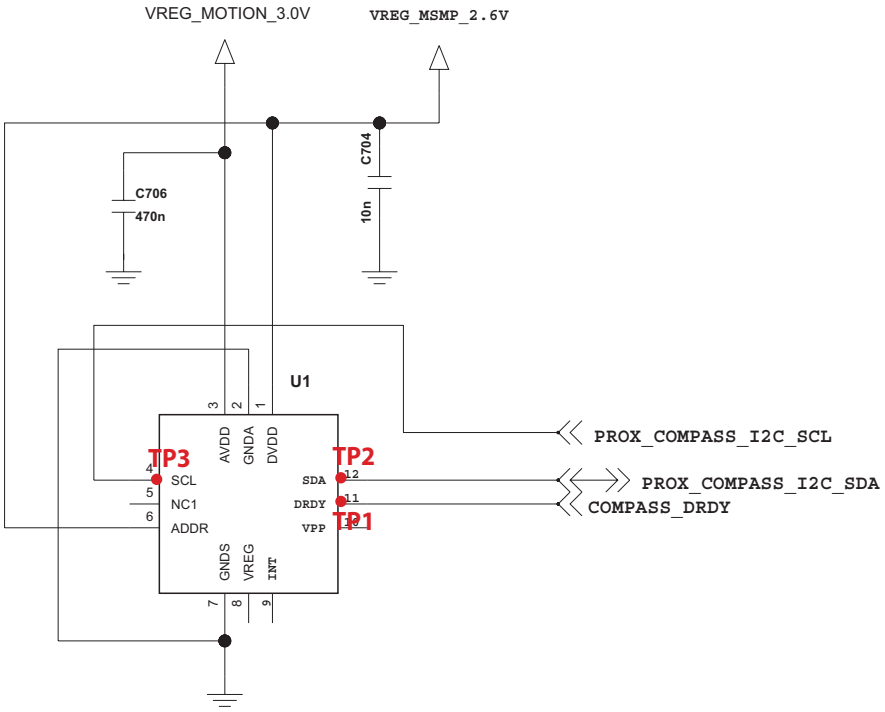
Measurement

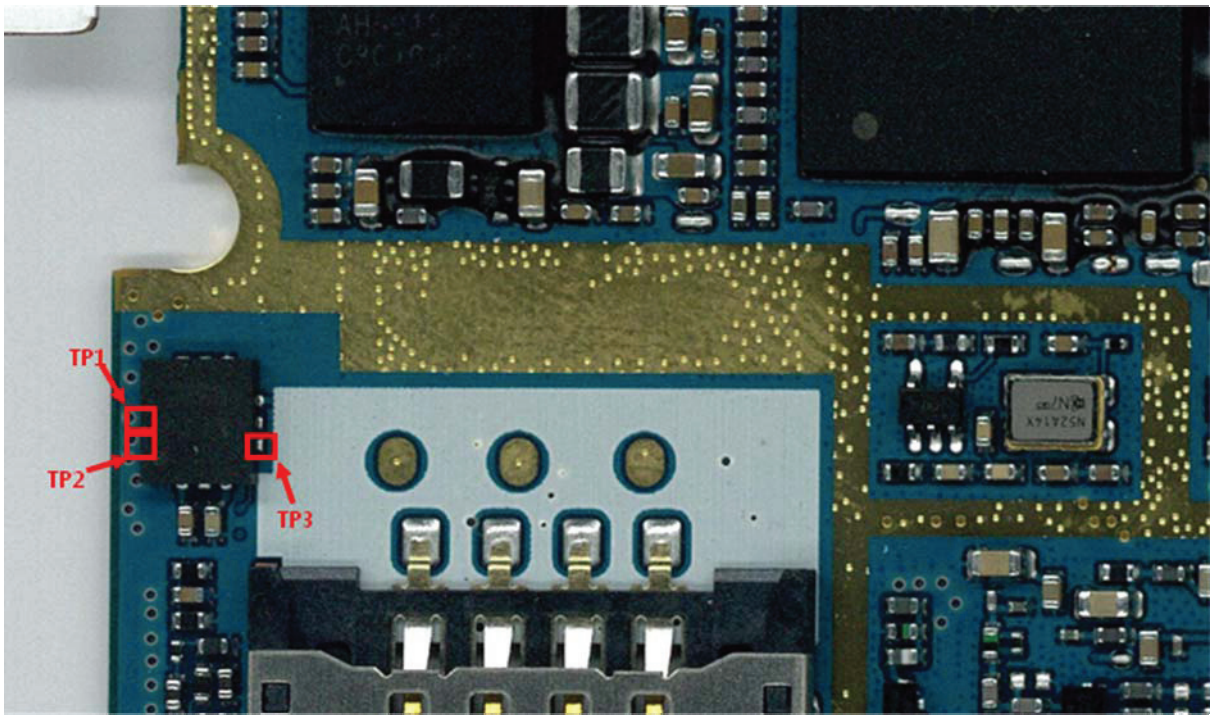
VREG_MSMP_2.6V

VREG_MOTION_3.0V

PROX_COMPASS_I2C_SCL / SDA

COMPASS_DRDY



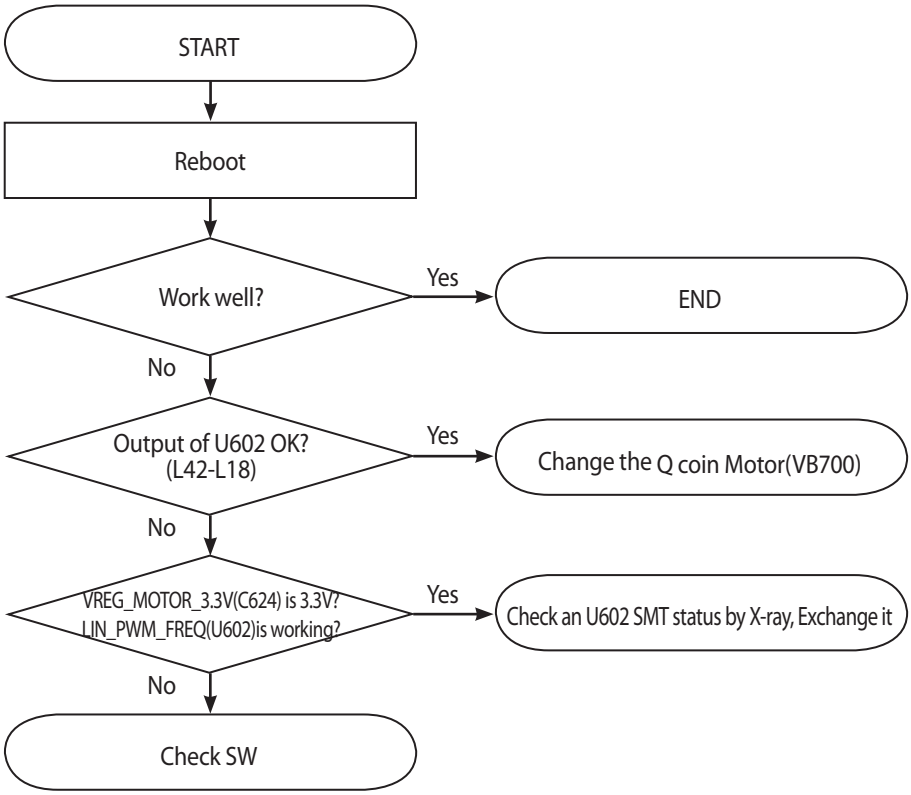


4.17 Q coin Motor

Q coin Motor is worked as below :

touch touch-window ➔ Vibration feedback

U601 : Used the PWM pulse

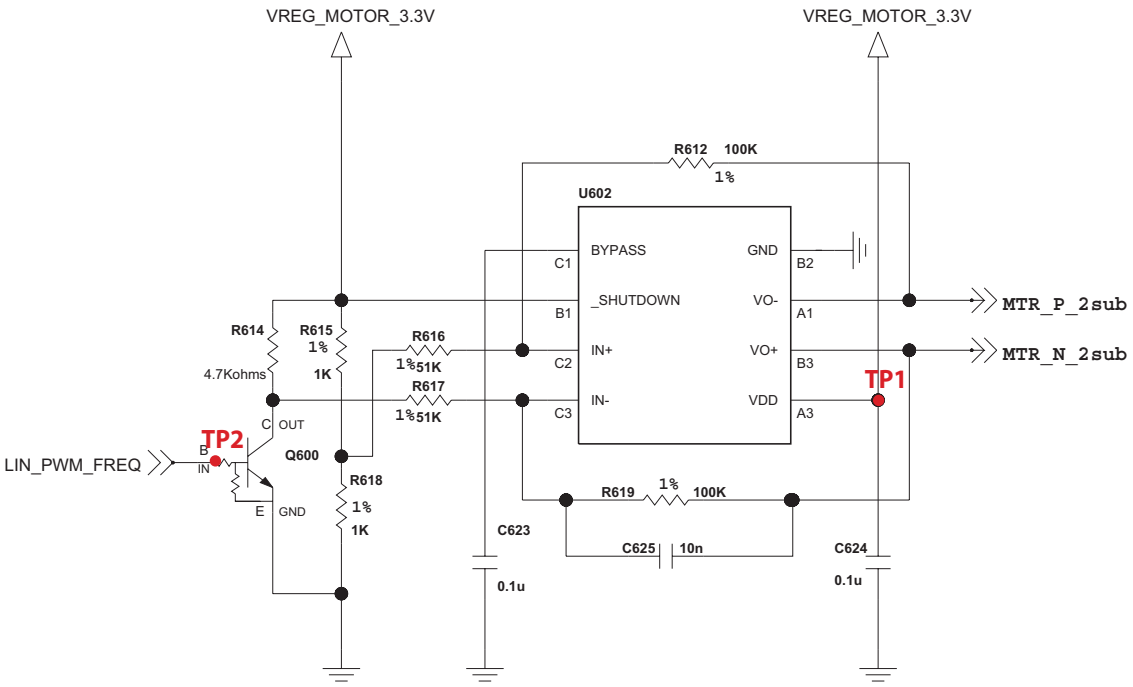


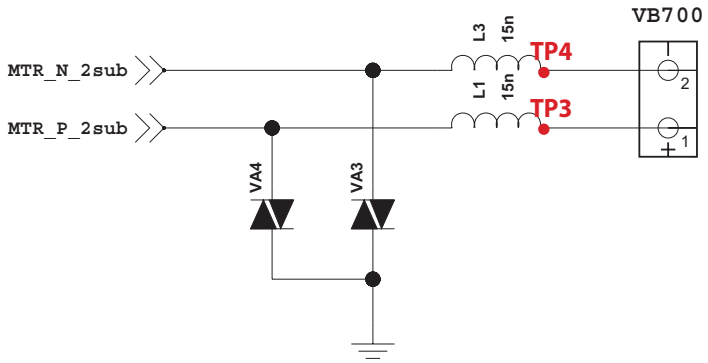
Measurement

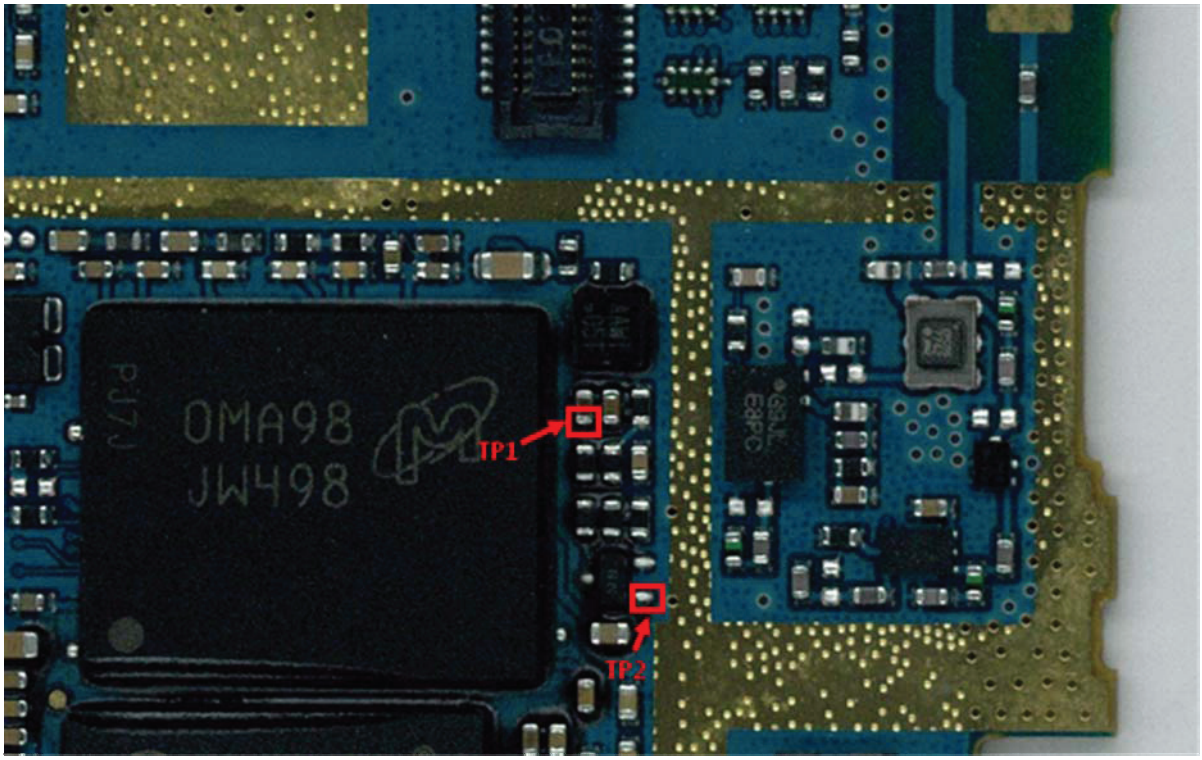
VREG_MOTOR_3.3V

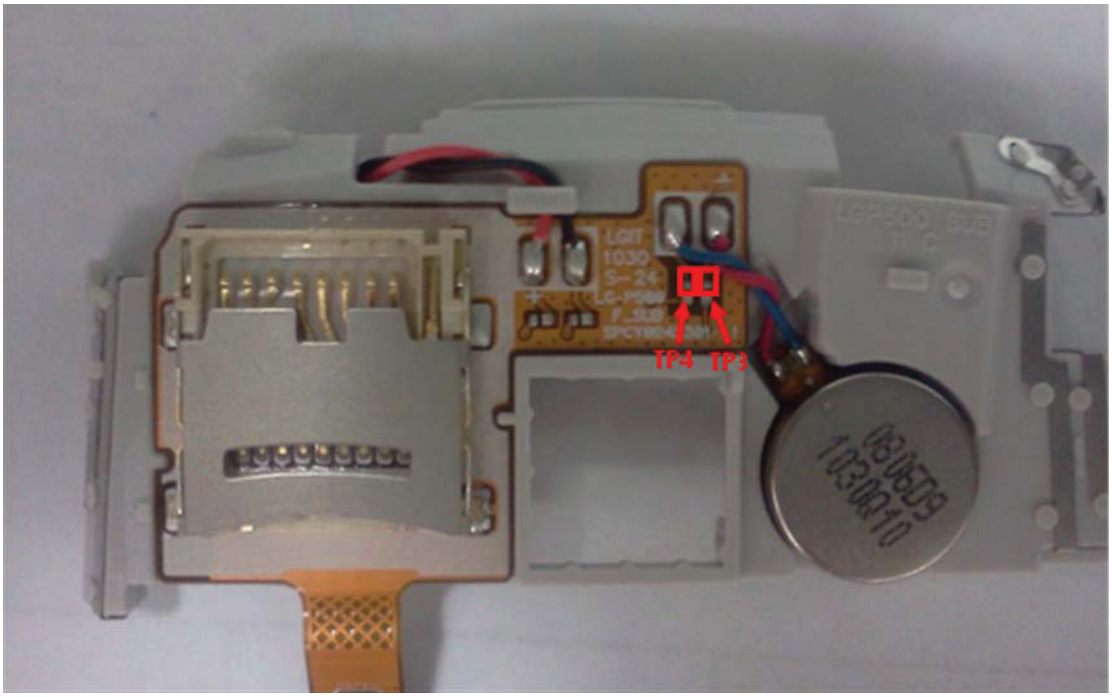
LIN_PWM_FREQ

MTR_N_2sub/MTR_P_2sub

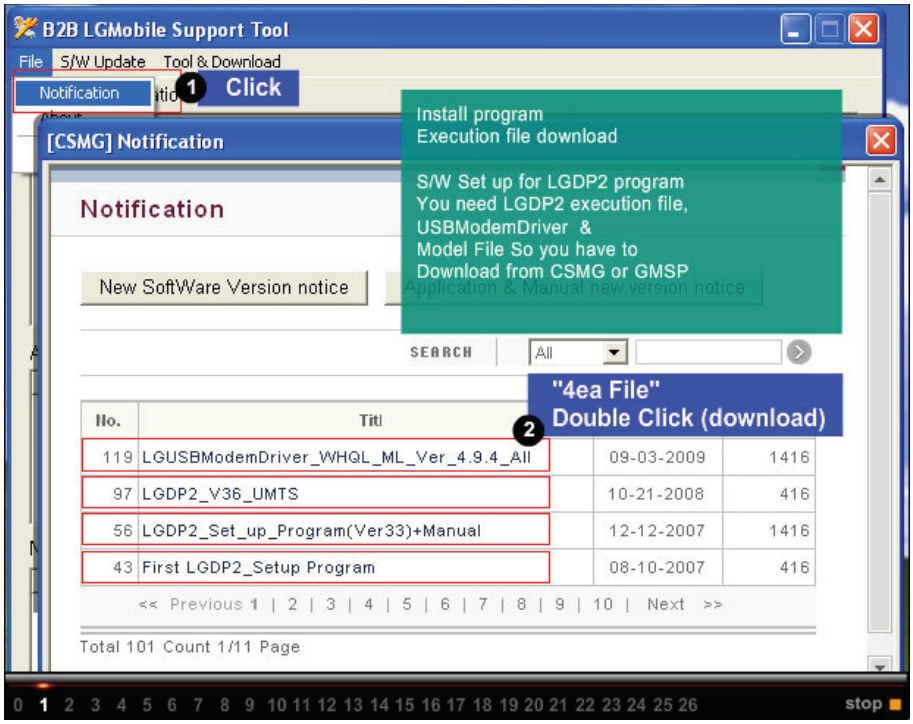


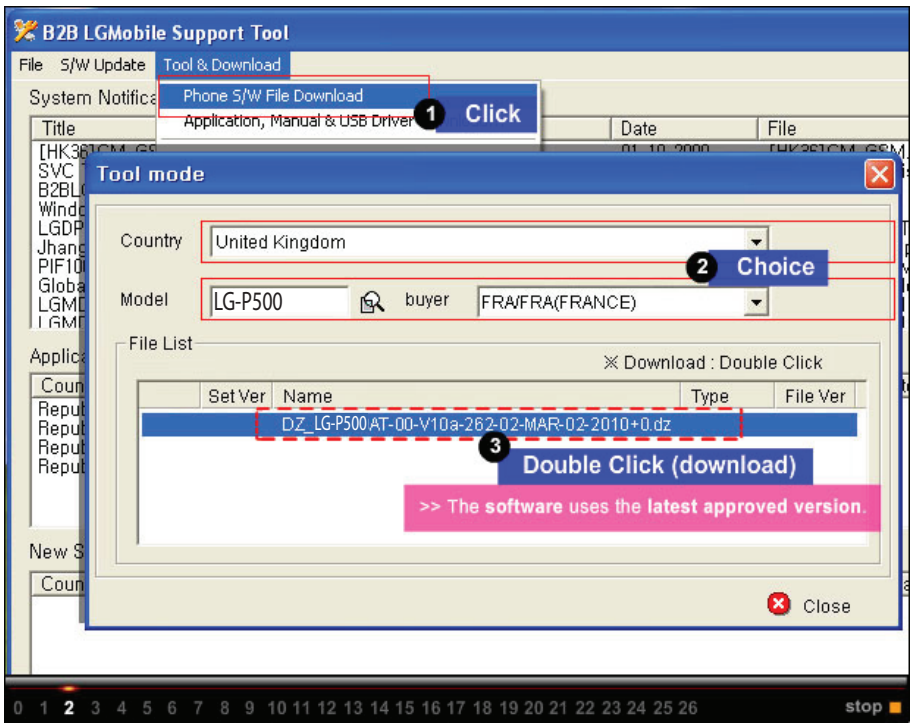


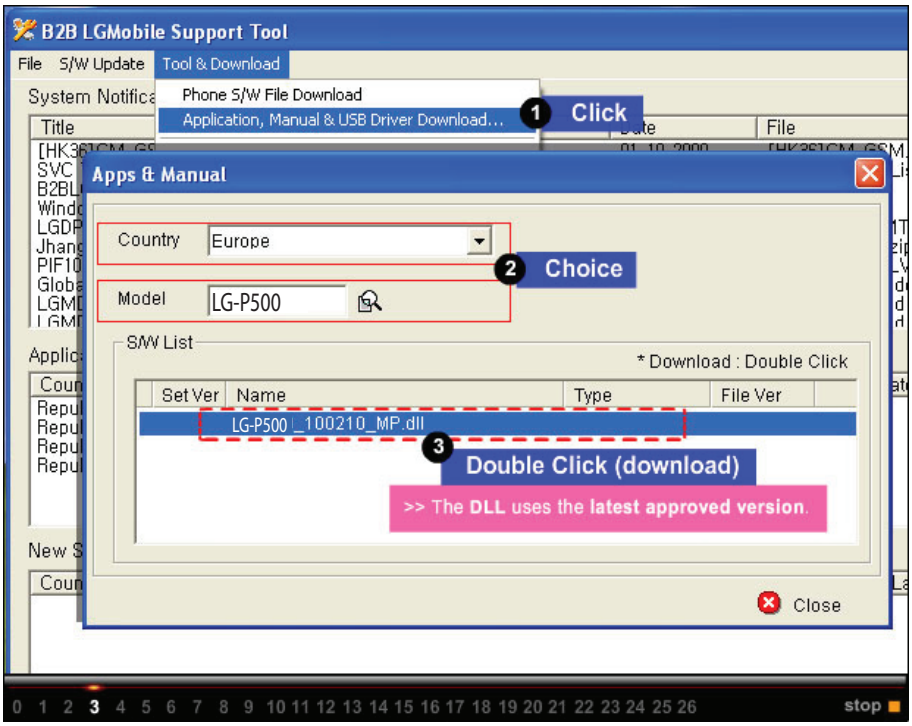


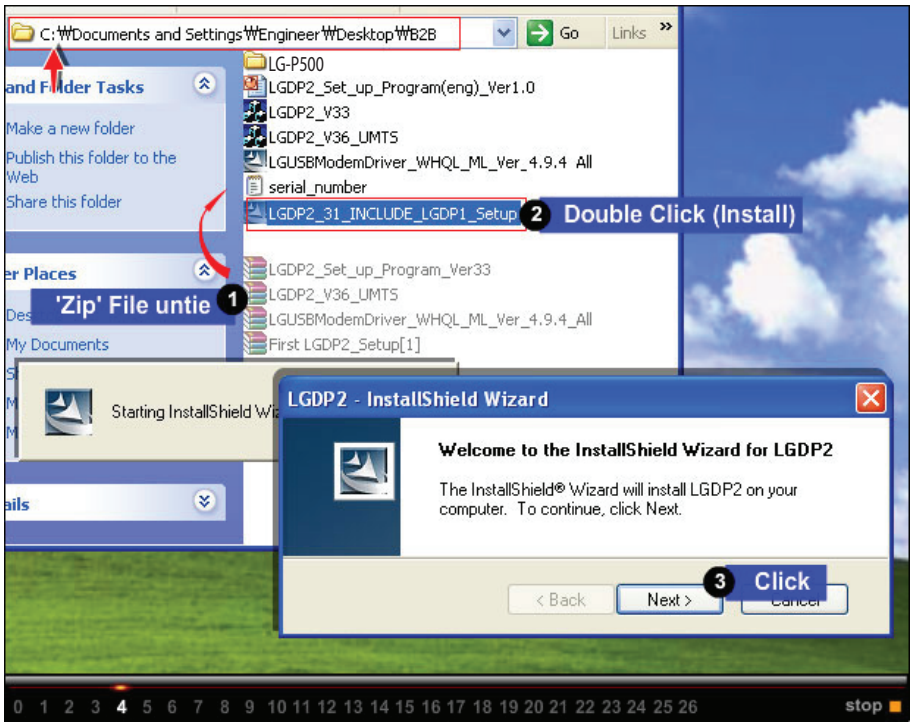


5. DOWNLOAD

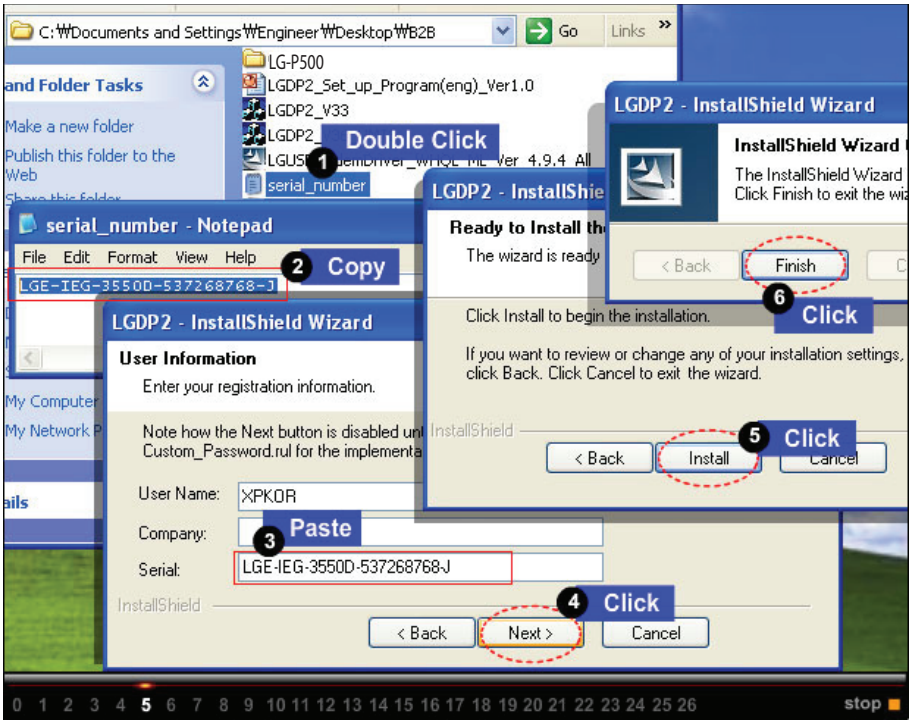


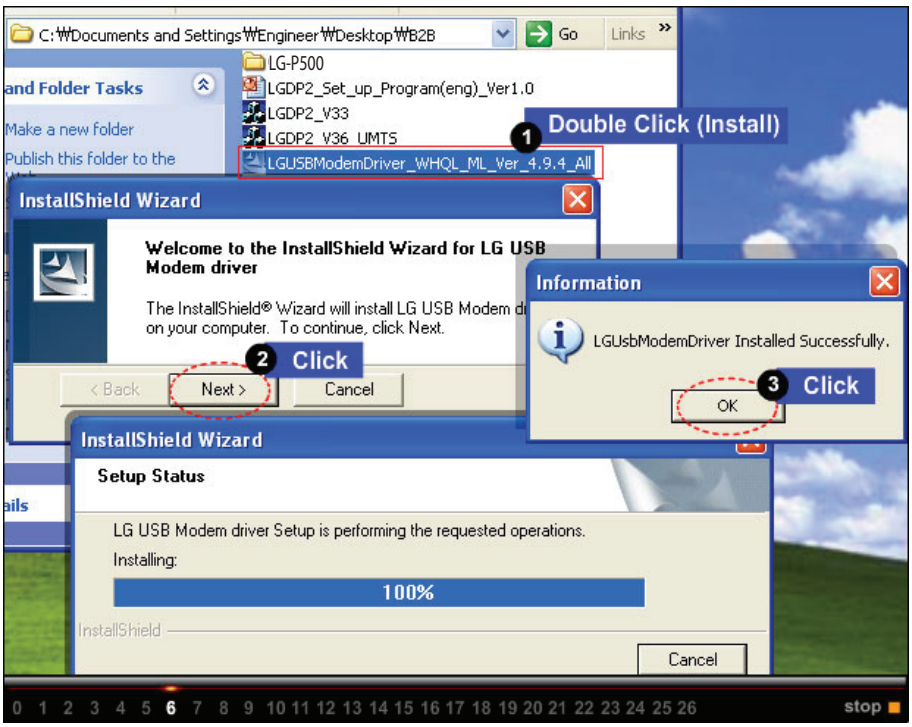


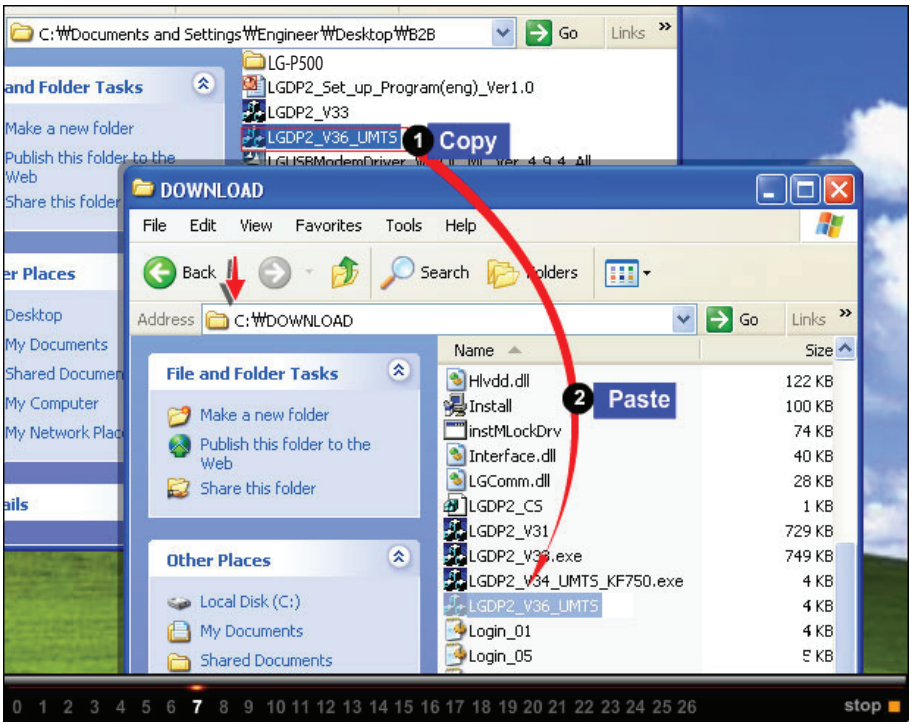


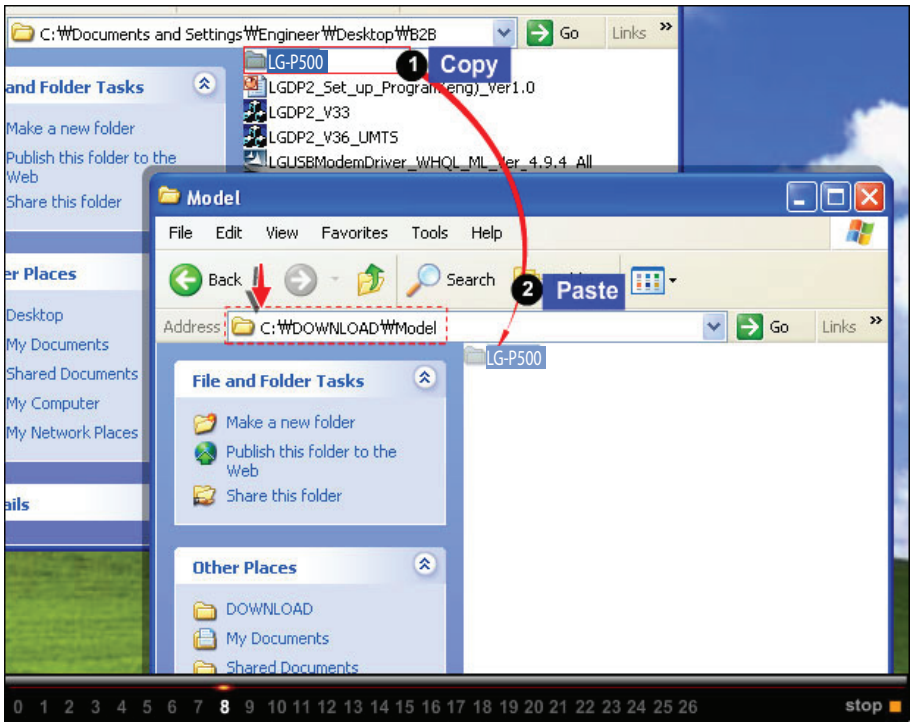


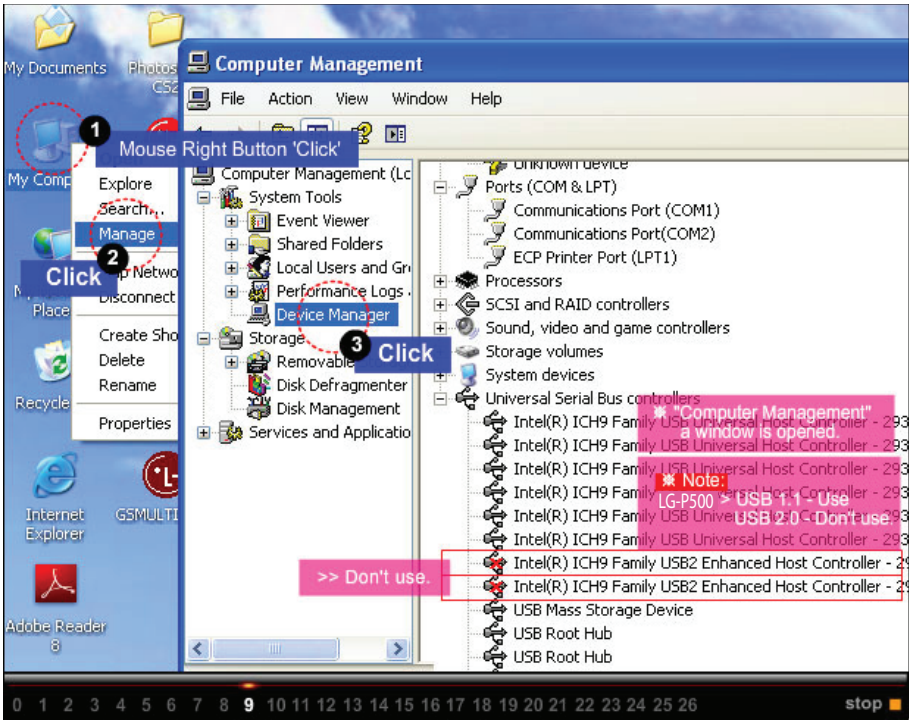
5. DOWNLOAD

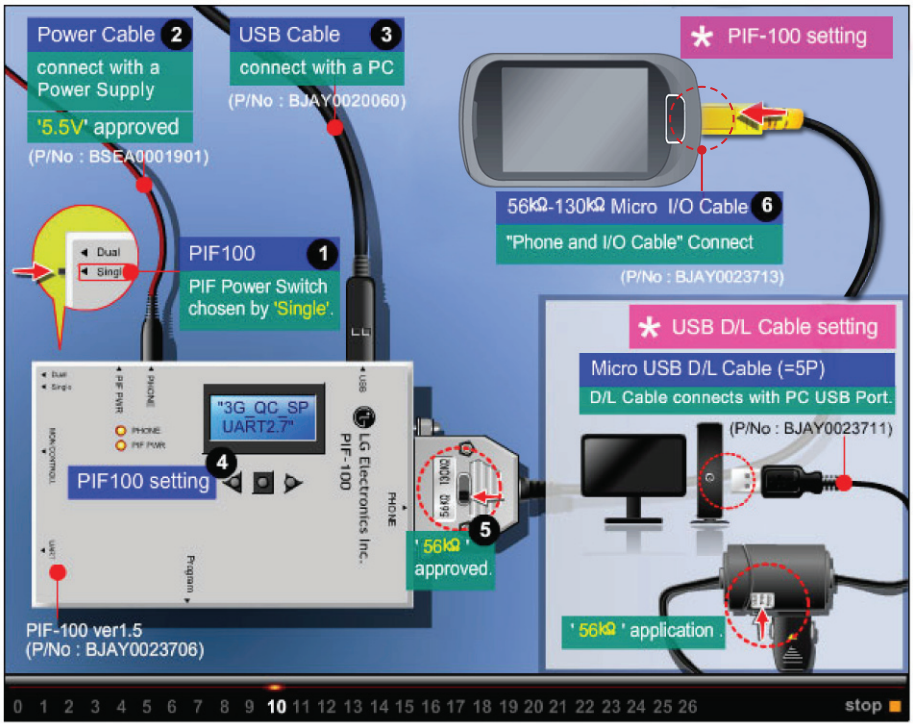


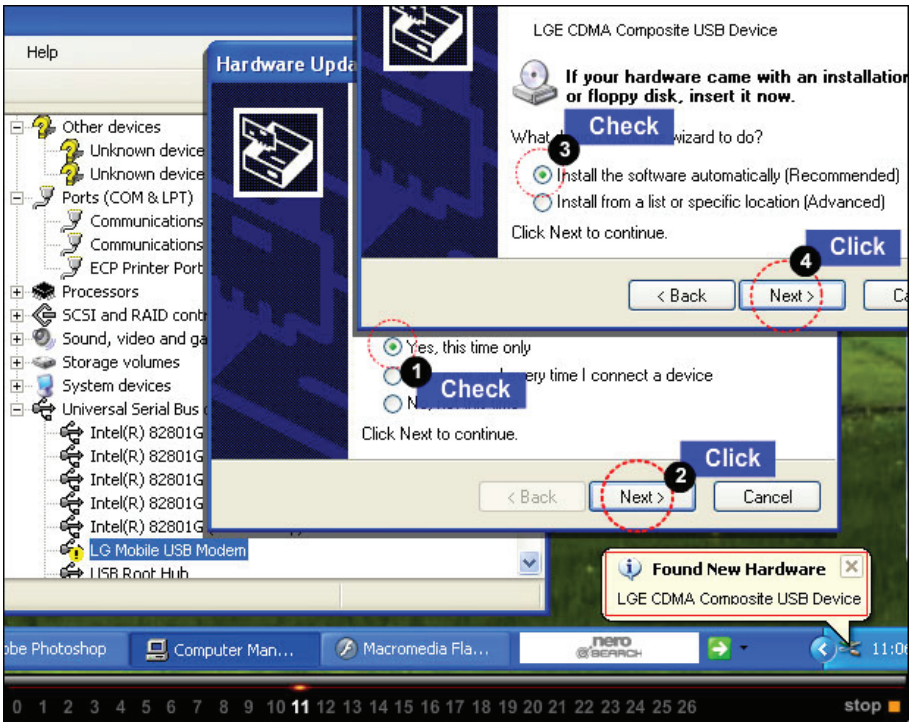


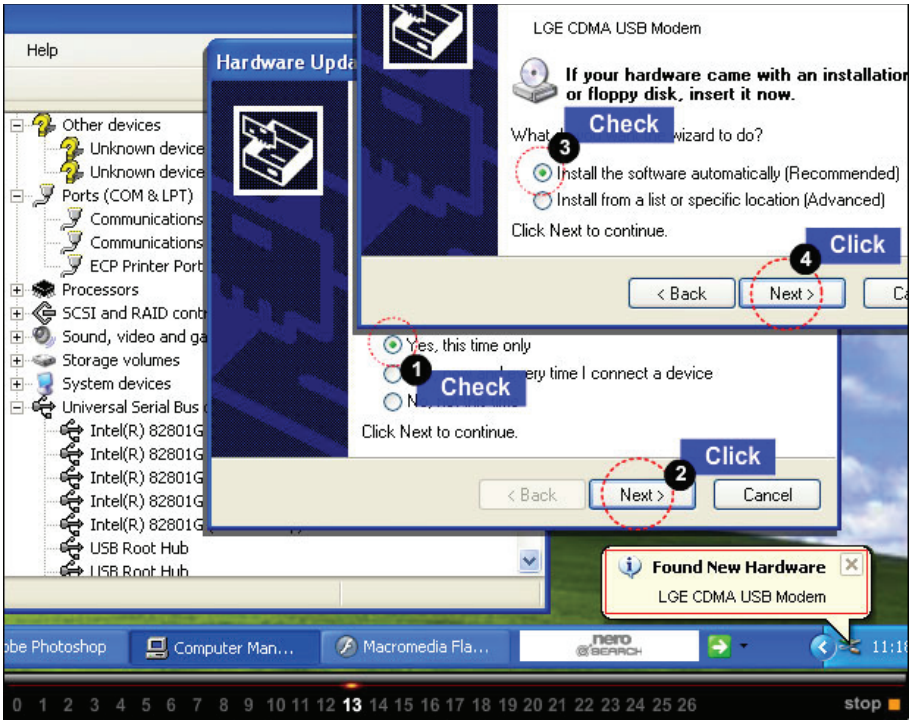


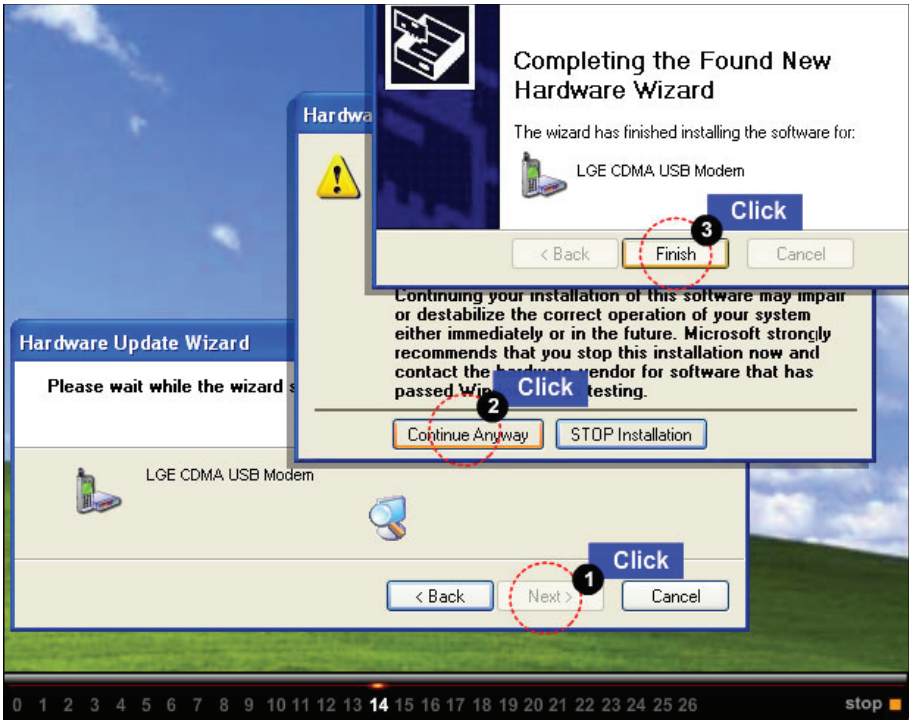


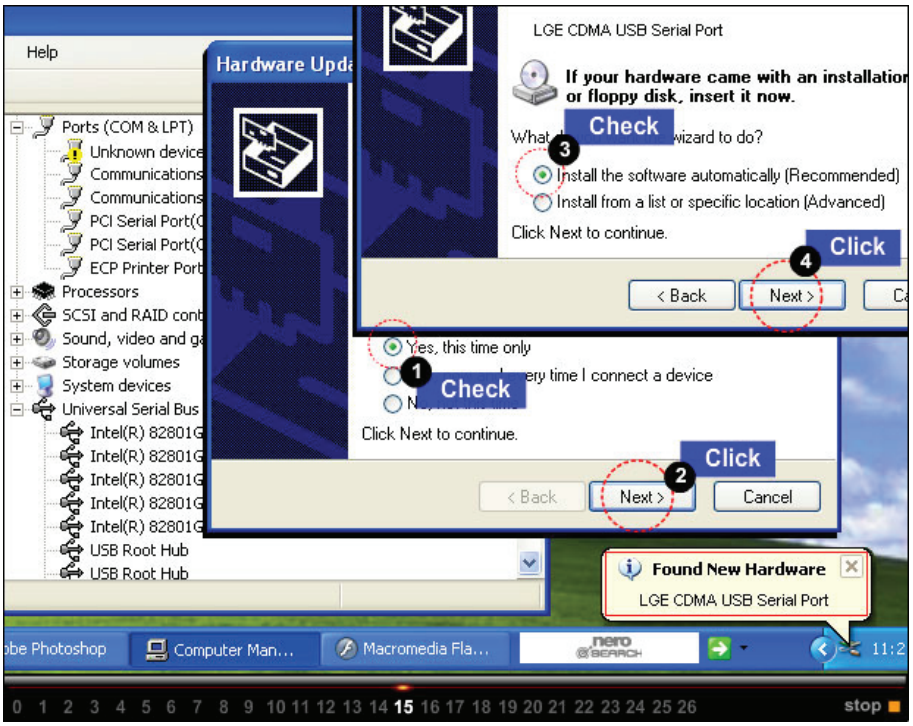












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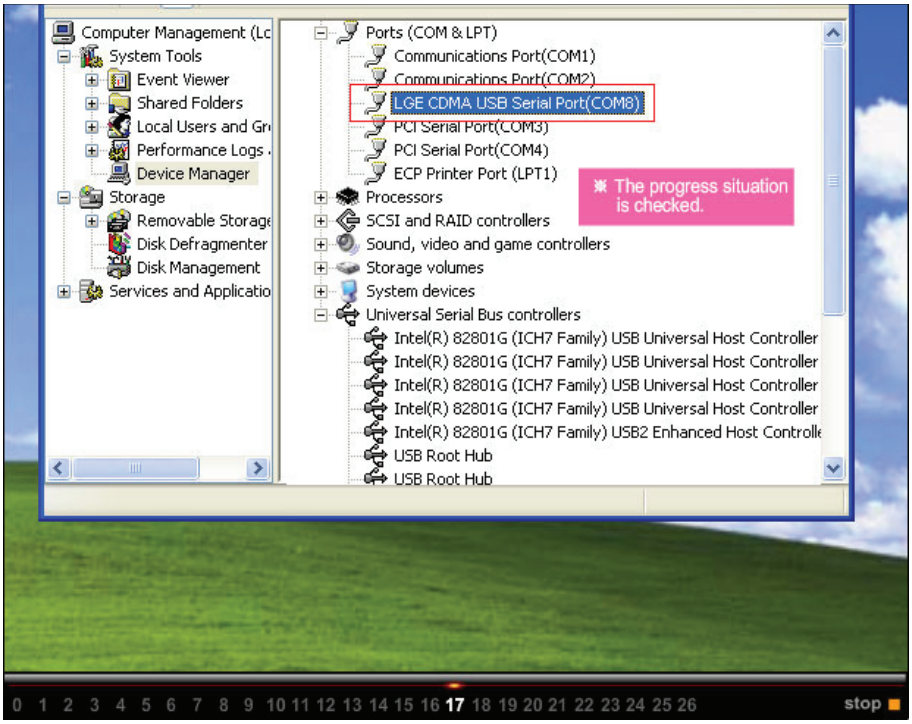
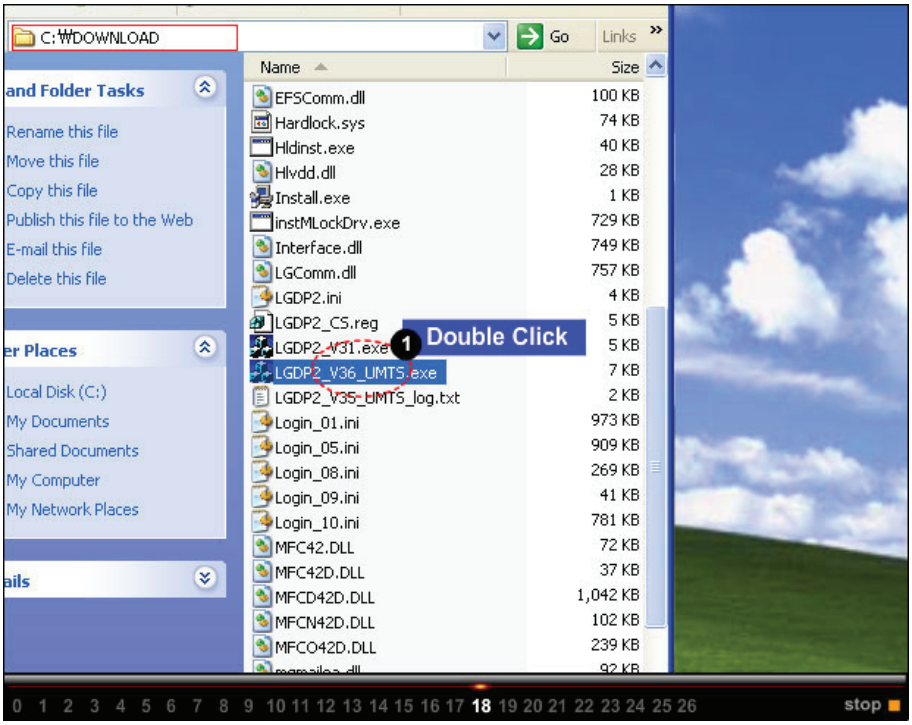
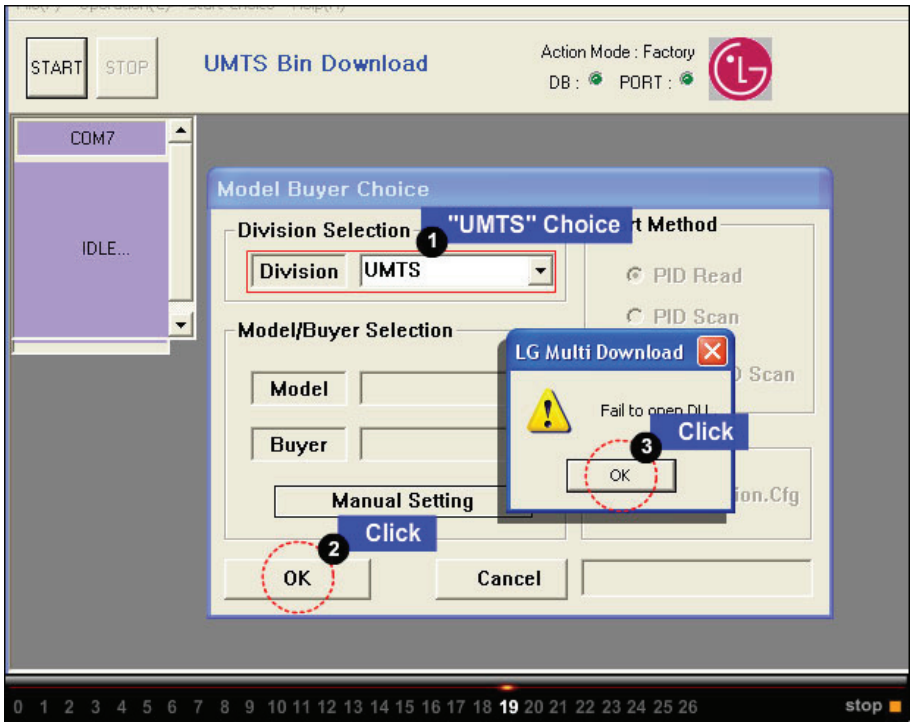
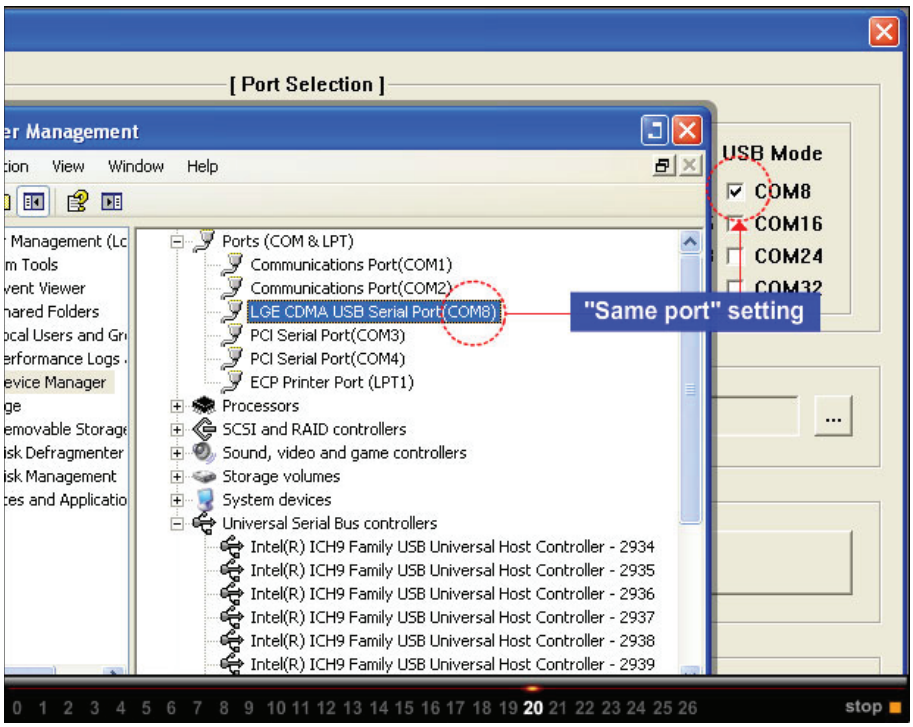
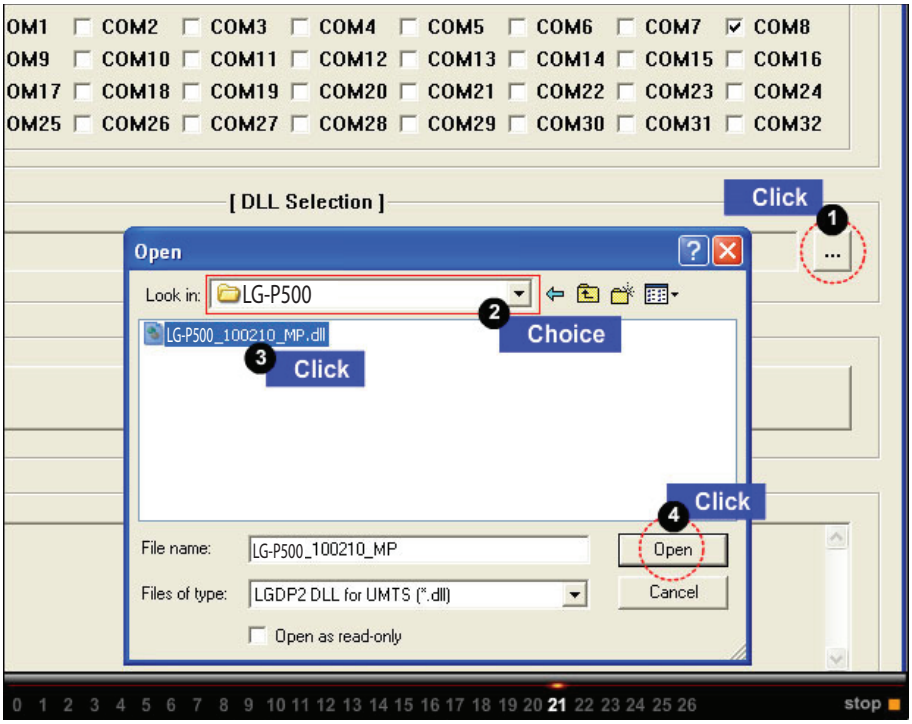
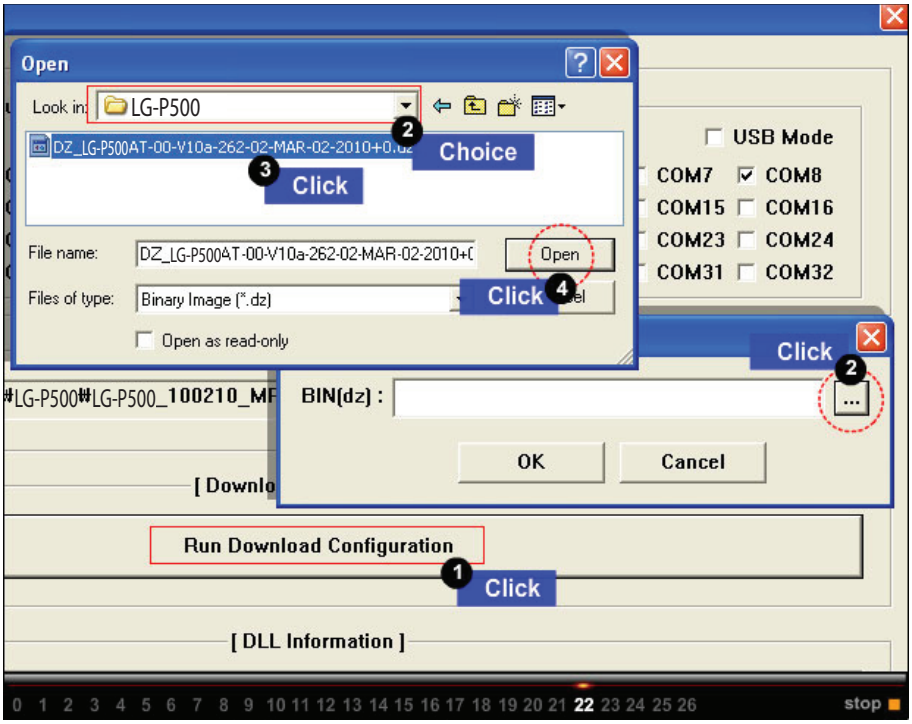


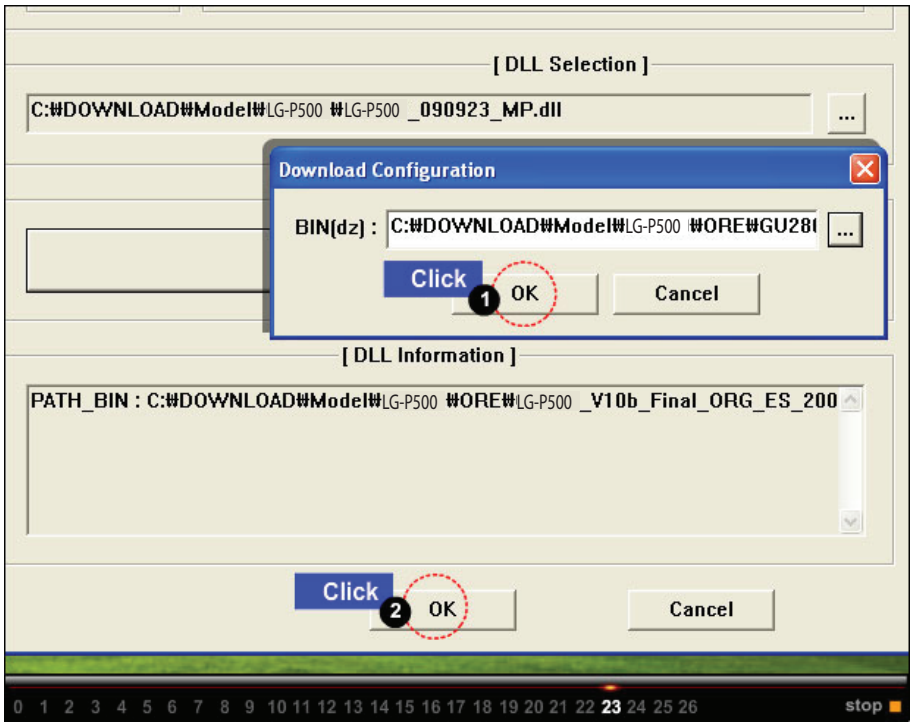


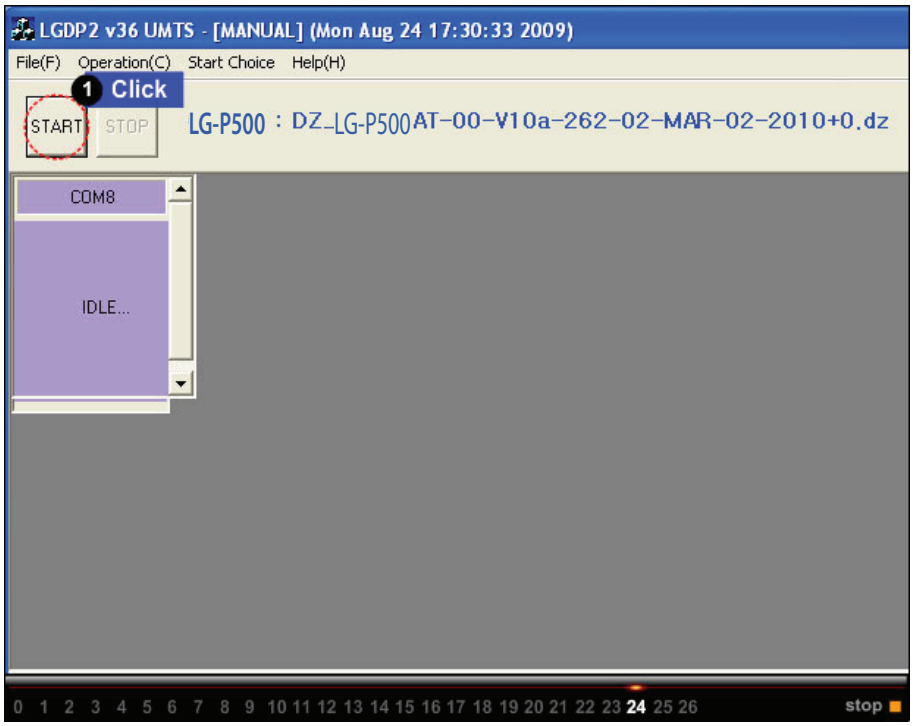


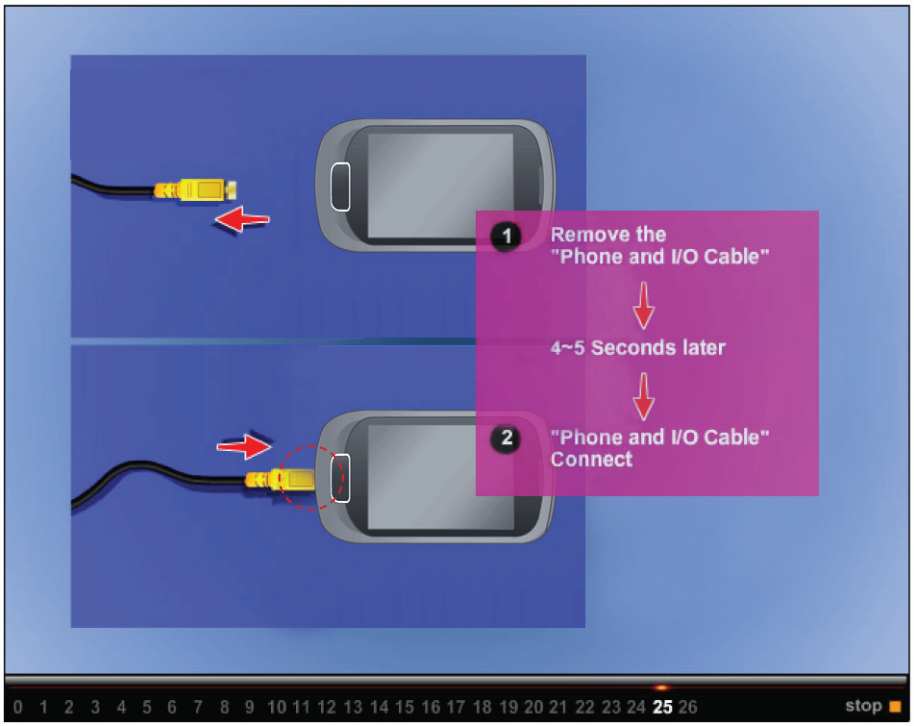


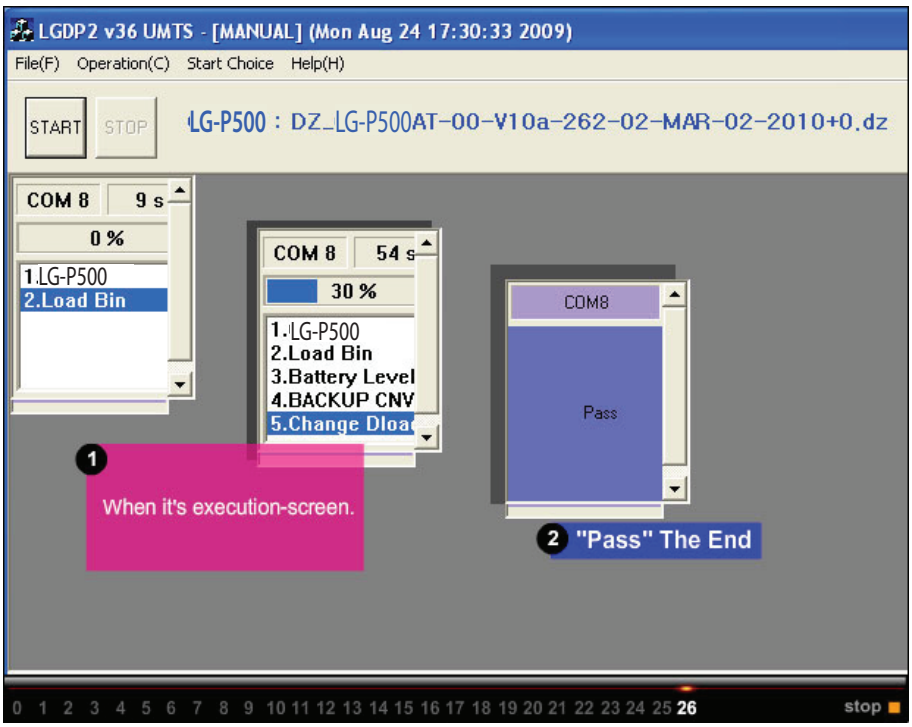




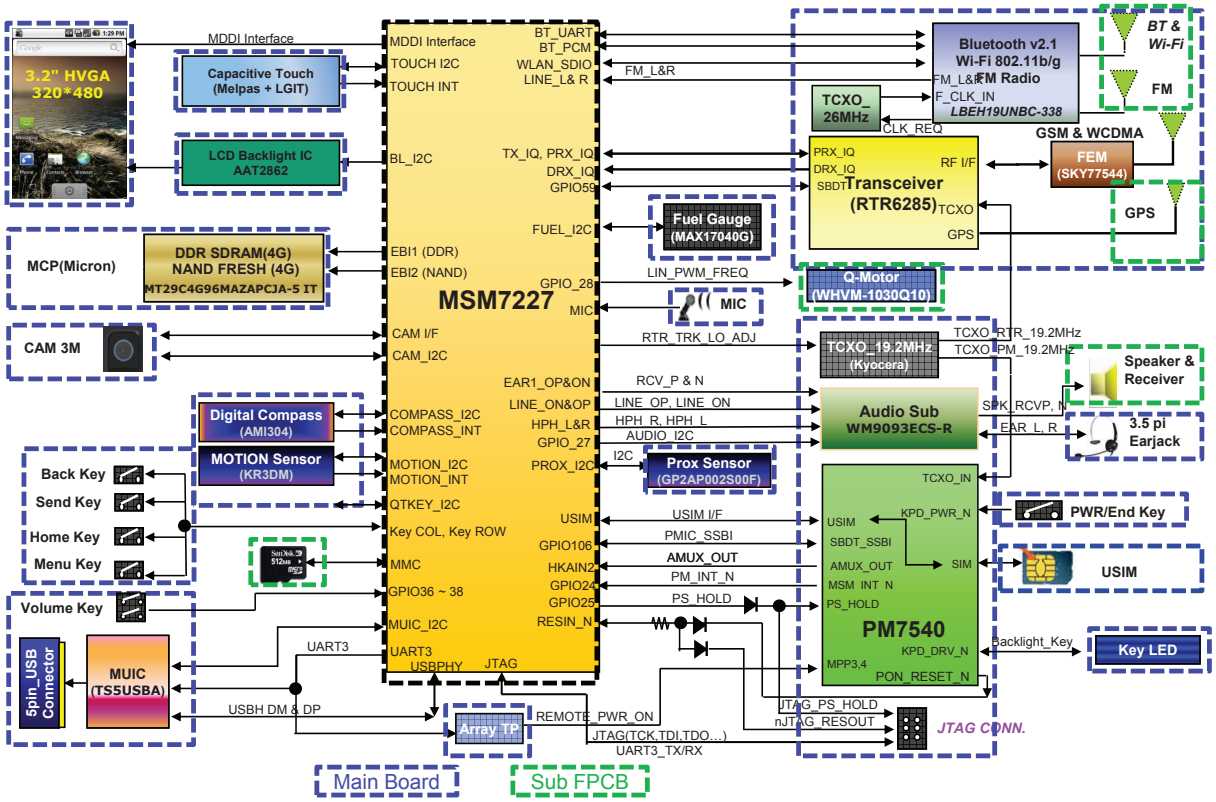




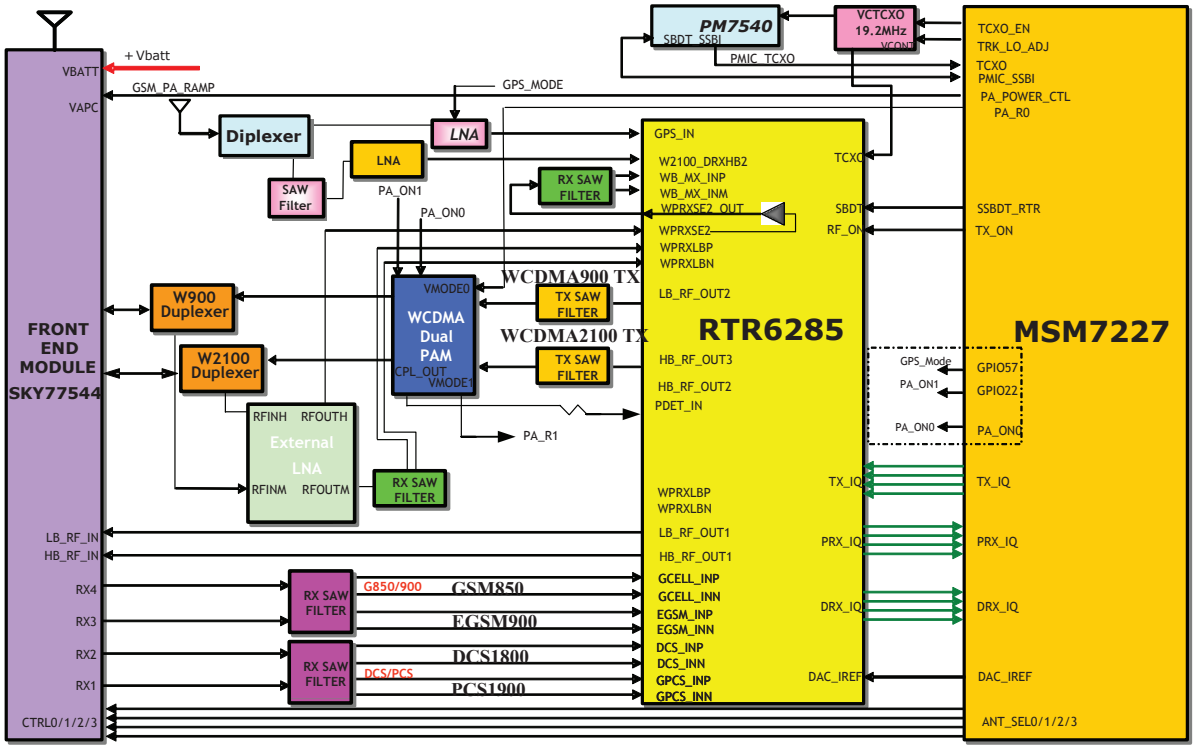


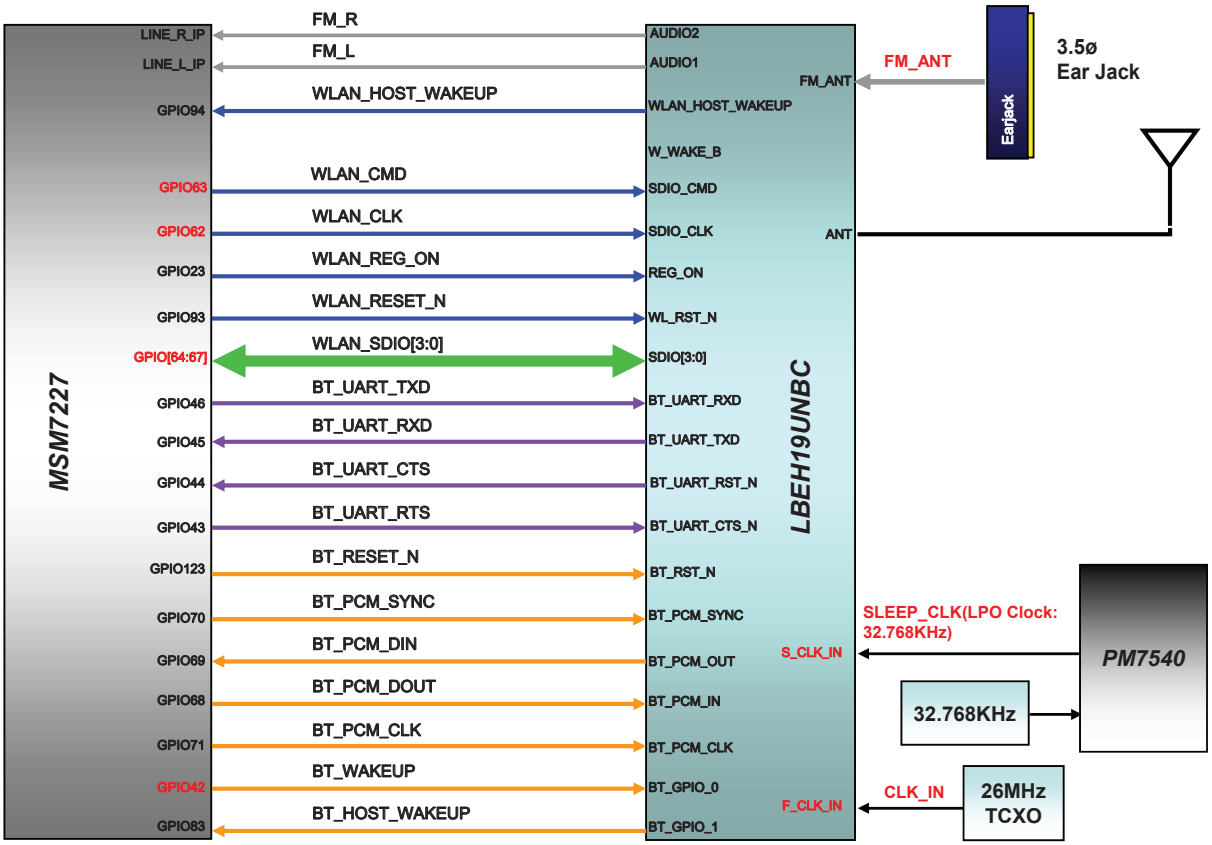


6. BLOCK DIAGRAM

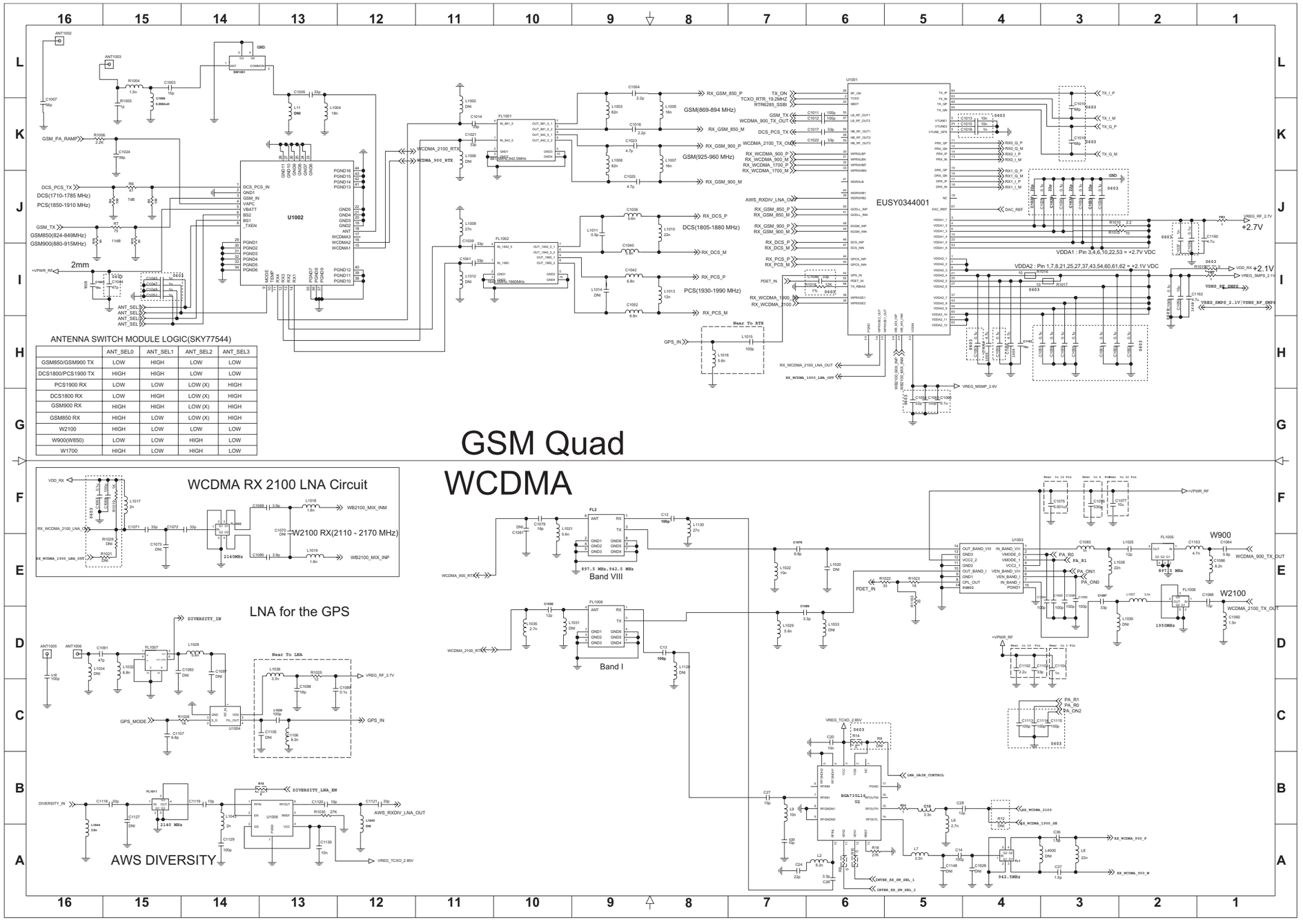


6. BLOCK DIAGRAM

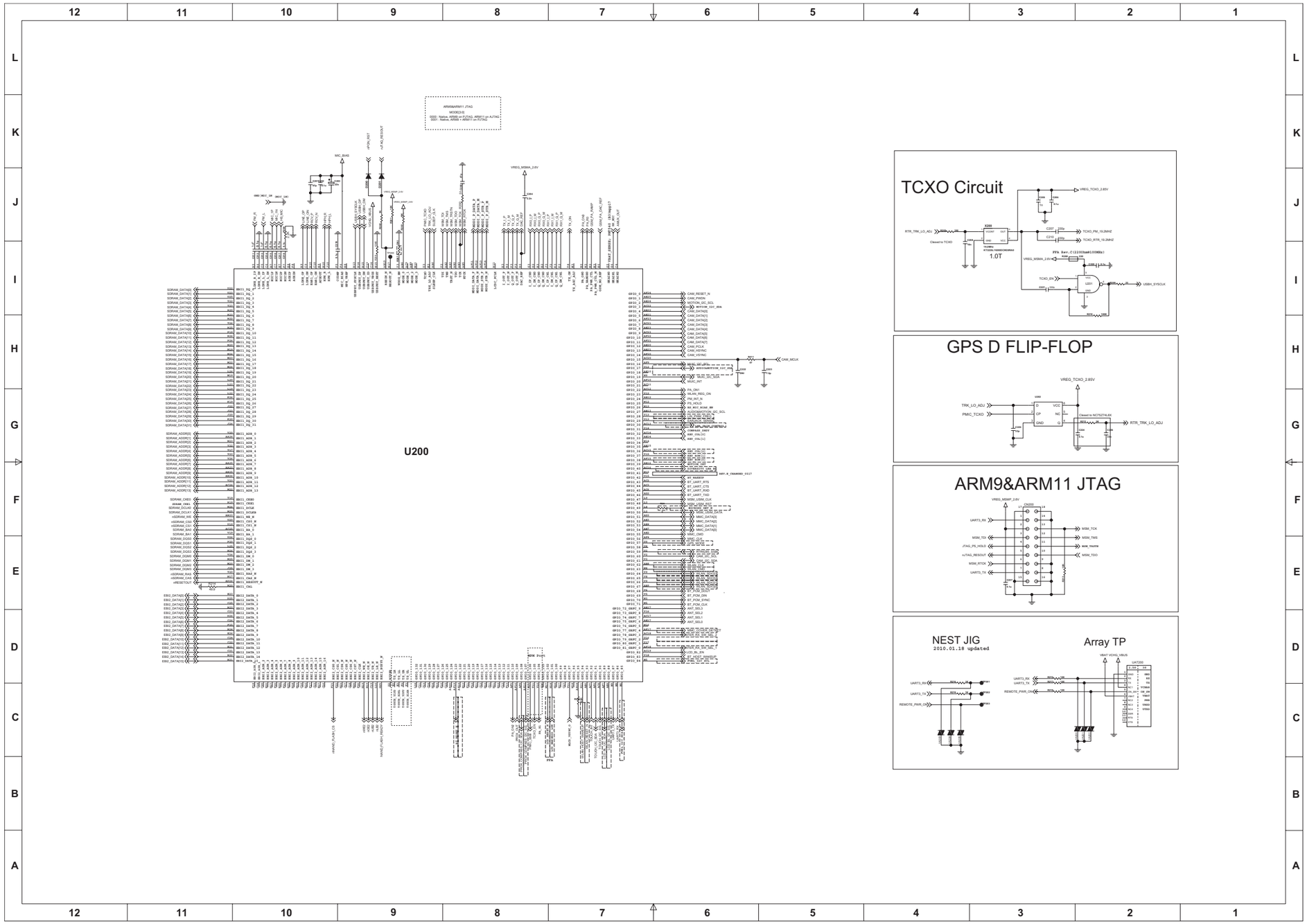




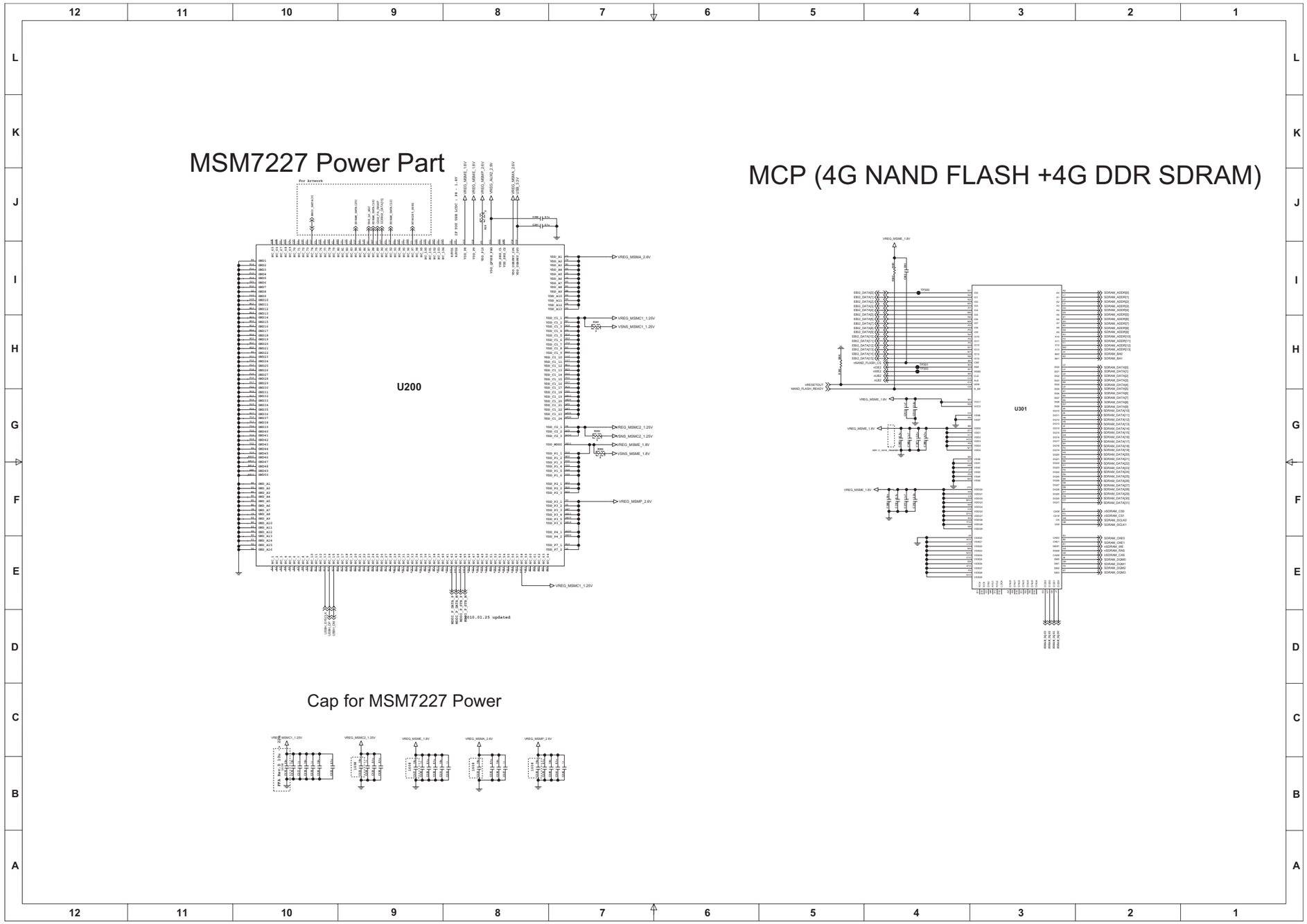
7. CIRCUIT DIAGRAM



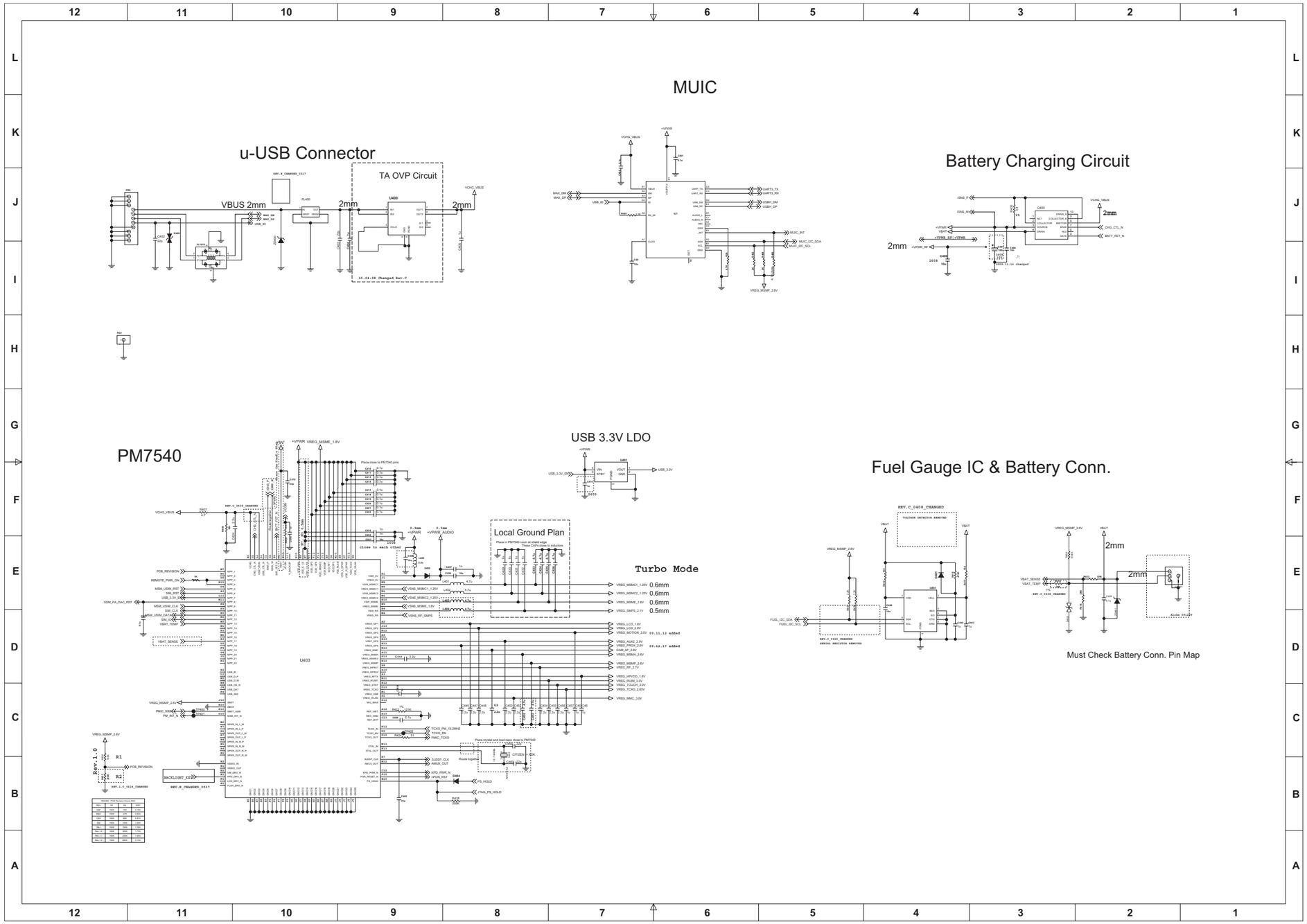
7. CIRCUIT DIAGRAM



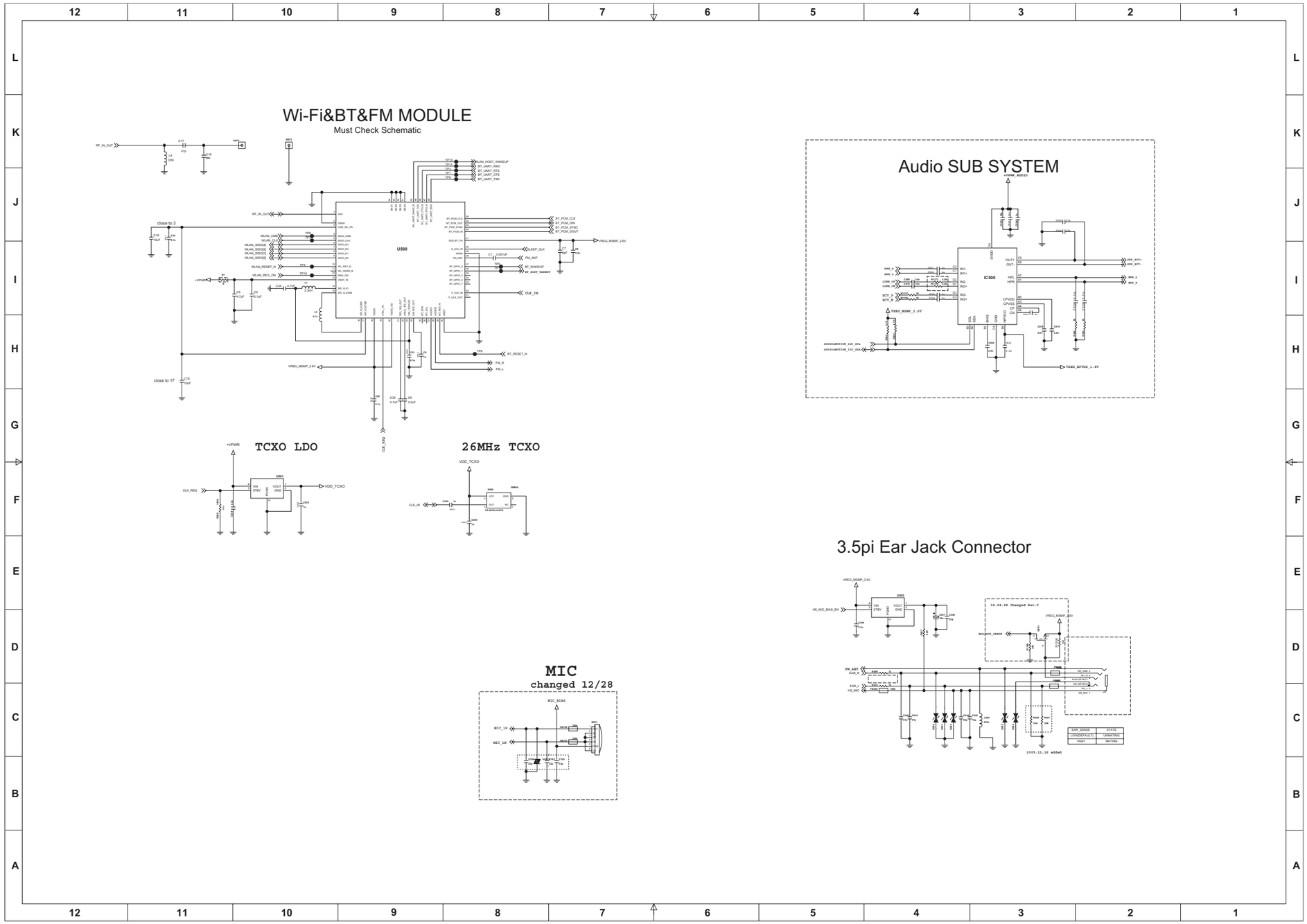
7. CIRCUIT DIAGRAM



7. CIRCUIT DIAGRAM

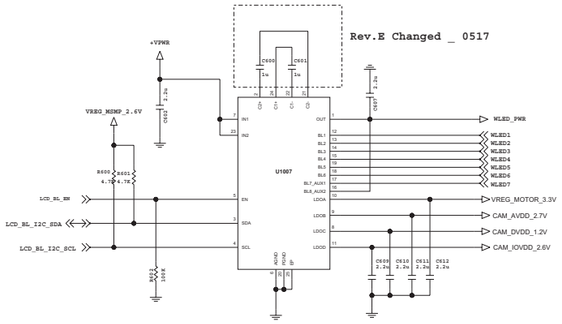


7. CIRCUIT DIAGRAM



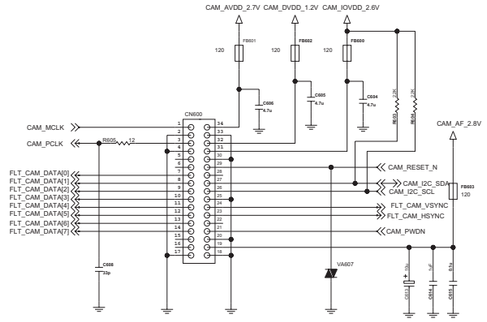
7. CIRCUIT DIAGRAM

BACKLIGHT CHARGE PUMP

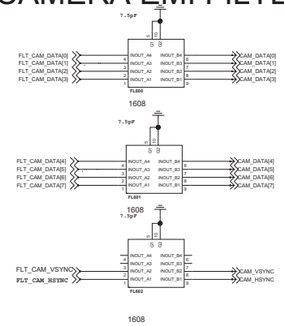


3M CAMERA

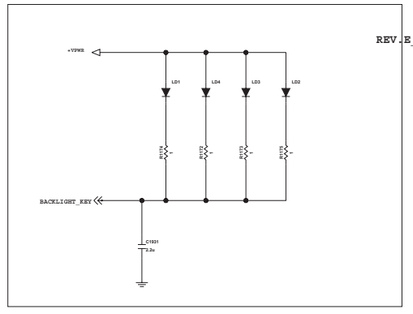
LGIT_1/4'' SVCY0024801(C3AA-Y314A)



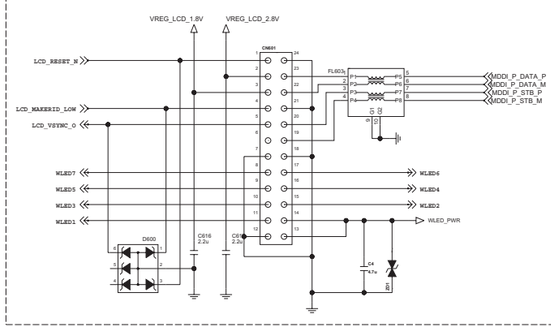
CAMERA EMI FILTER



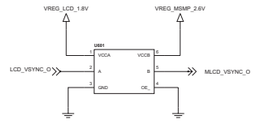
KEY BACKLIGHT LED



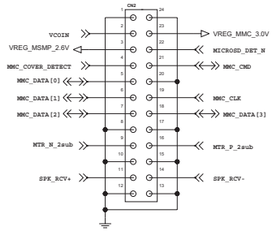
3.2" HVGA LCD Connector



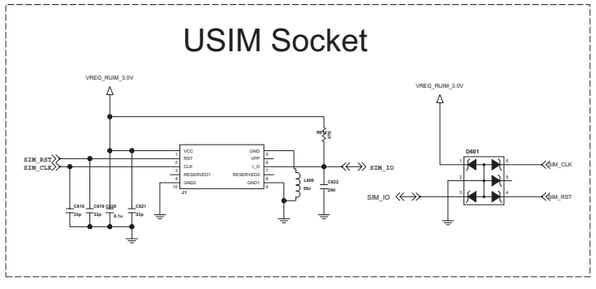
LEVEL SHIFT



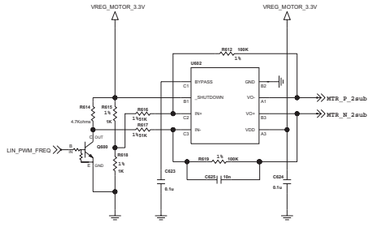
MAIN-SUB CONNECTOR



USIM Socket

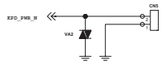


Q-coin MOTOR

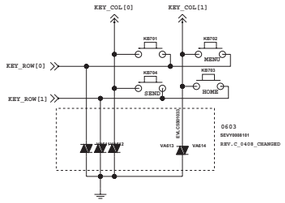


7. CIRCUIT DIAGRAM

POWER KEY

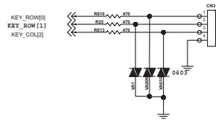


HOT KEY



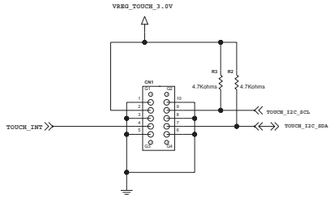
VOLUME SIDEKEY

2010.01.20 updated

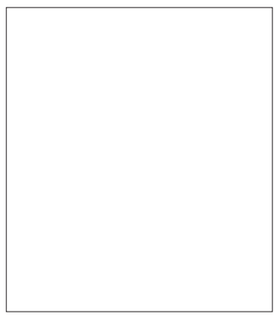


HALL IC(N.A)

TOUCH

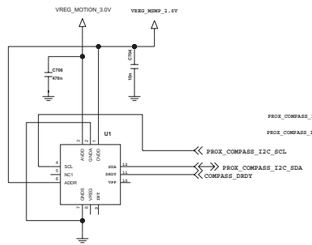


DOCKING

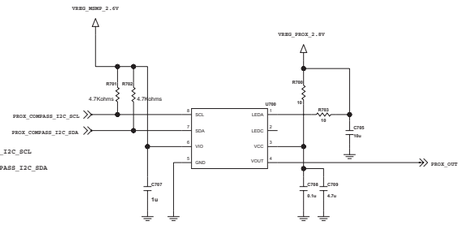


REV.E_CHANGED_0517

Digital Compass

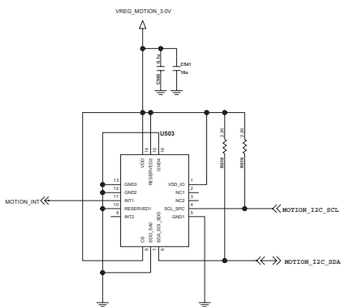


Proximity Sensor



Acceleration Sensor

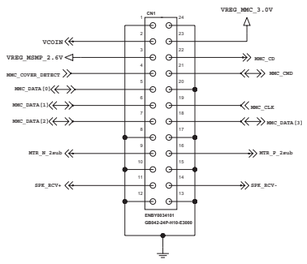
Must Check Schematic



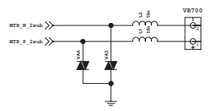
7. CIRCUIT DIAGRAM

LGP500_SUB_PCB_Rev A

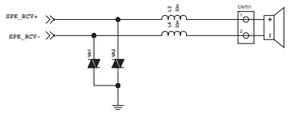
Main2Sub B2B



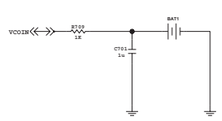
VIBRATOR(Q-Motor)



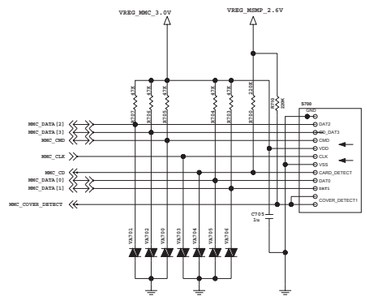
SPEAKER PAD



BACK-UP BATTERY



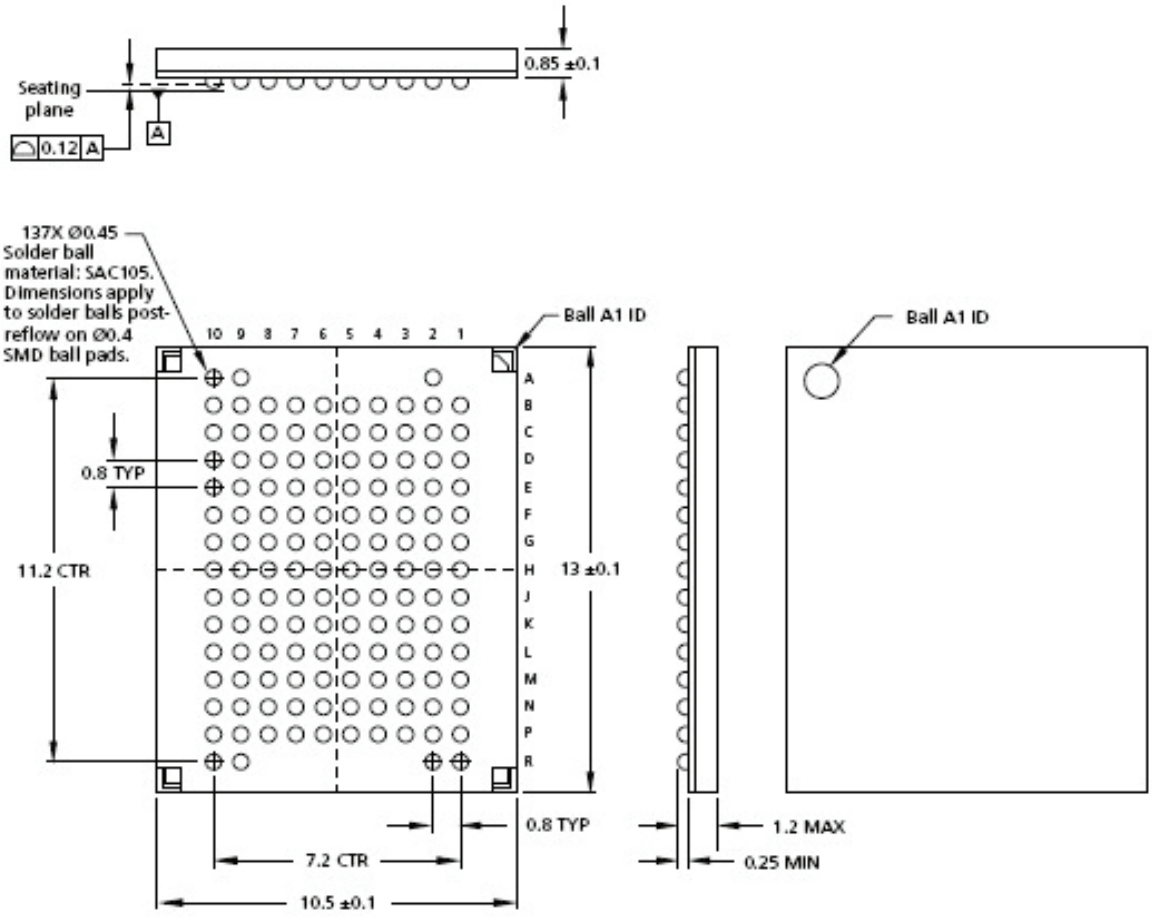
Micro SD Socket



8. BGA PIN MAP

MCP

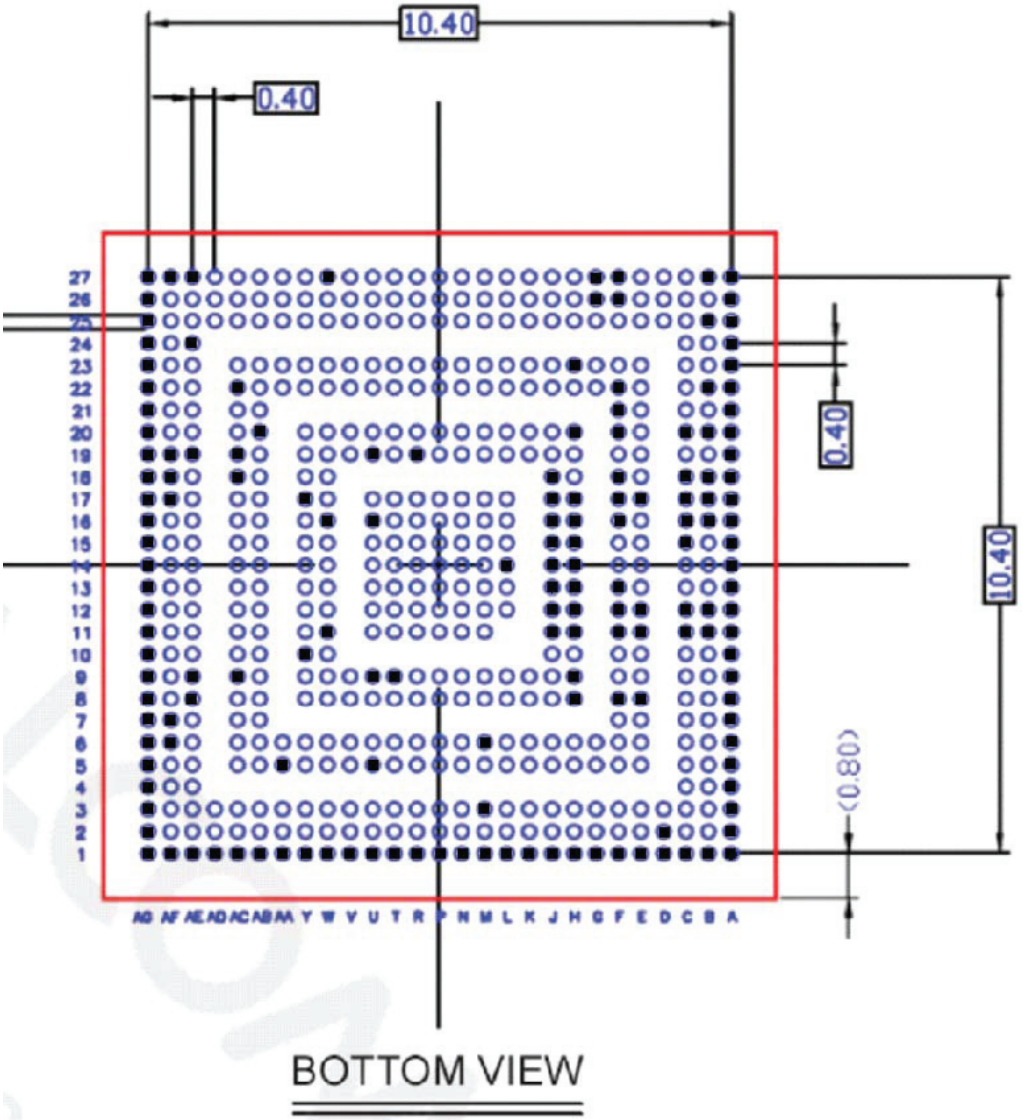
Figure 5: 137-Ball TFBGA (Package Code: JA)



Notes: 1. All dimensions are in millimeters.
2. Recommended pad size is 0.4 x 0.4mm.

8. BGA PIN MAP

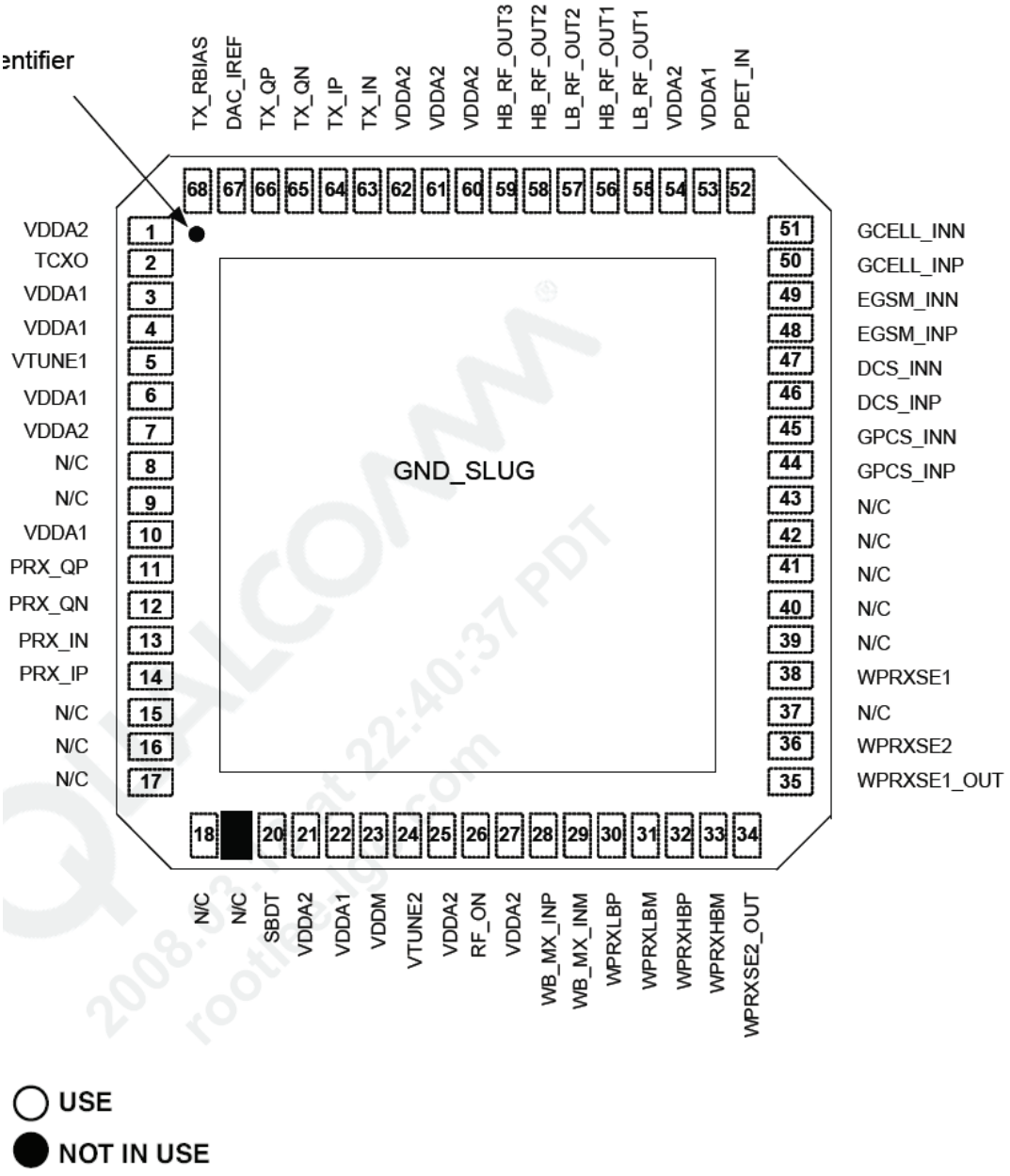
MSM7227



○ USE

● NOT IN USE

RTR6285(Top View)

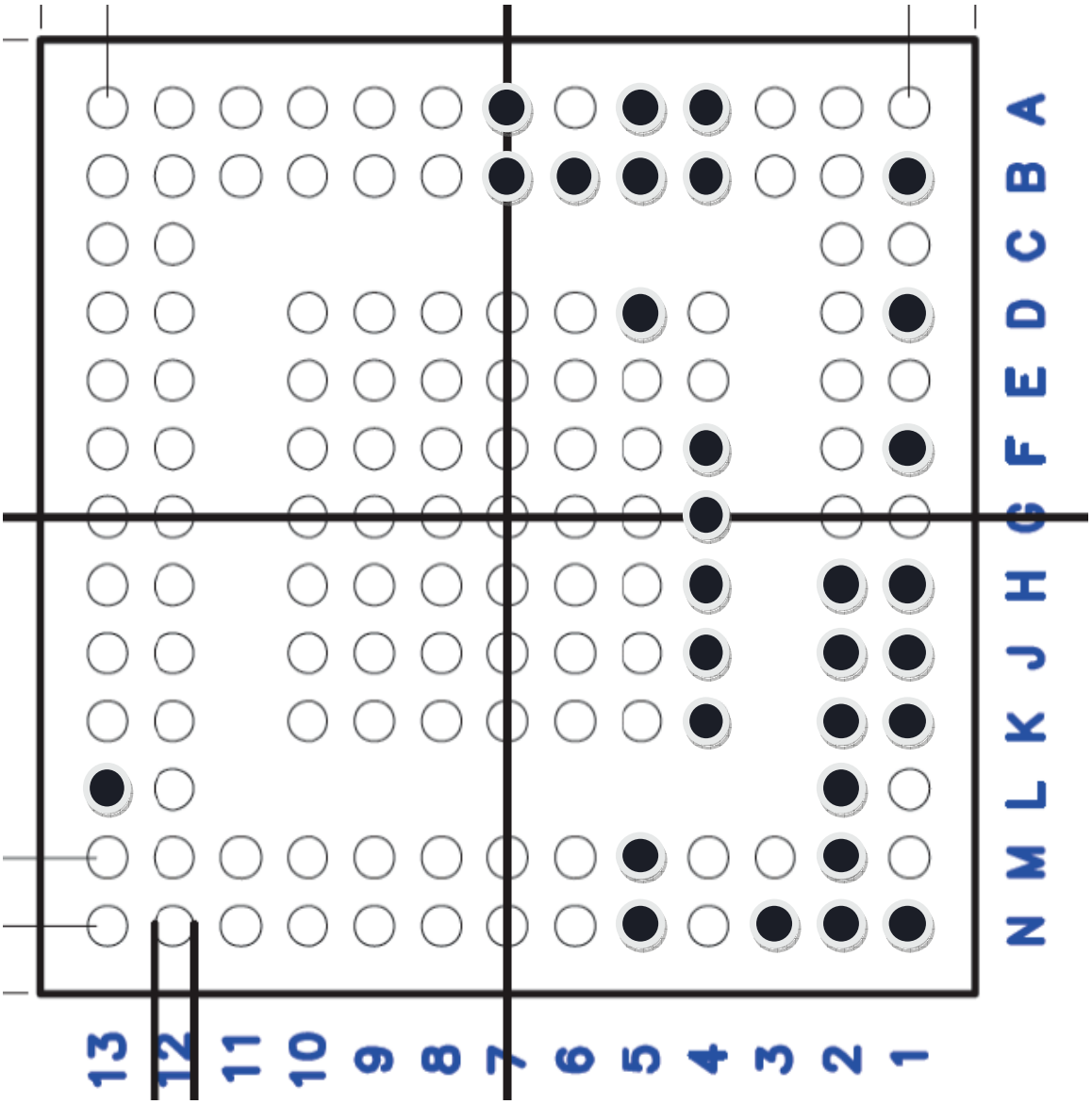


○ USE

● NOT IN USE

8. BGA PIN MAP

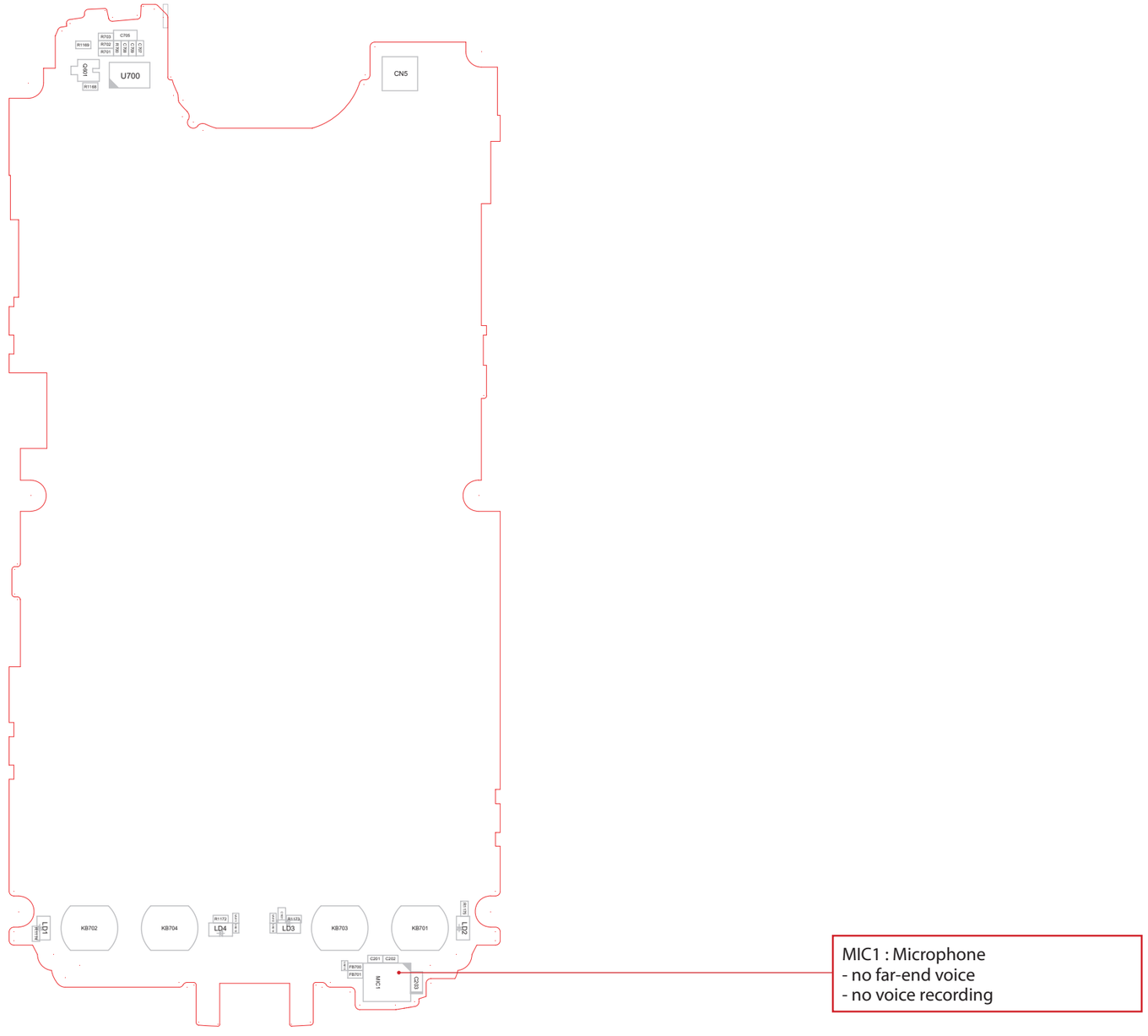
PM7540(PMIC)



○ USE

● NOT IN USE

9. PCB LAYOUT



LG-P500_MAIN_SPFY0233701-1.1_PLACE_TOP

9. PCB LAYOUT

IC500 : Audio AMP Sub System & Signal Distributor
- no Sound

CN2 : GPS,WIFI,Motor Connector
- no GPS/WiFi/Motor

CN1 : Touch Connector
- no touch sensing

U500 : BT+FM Radio Module
- no BT Connection
- no FM Radio

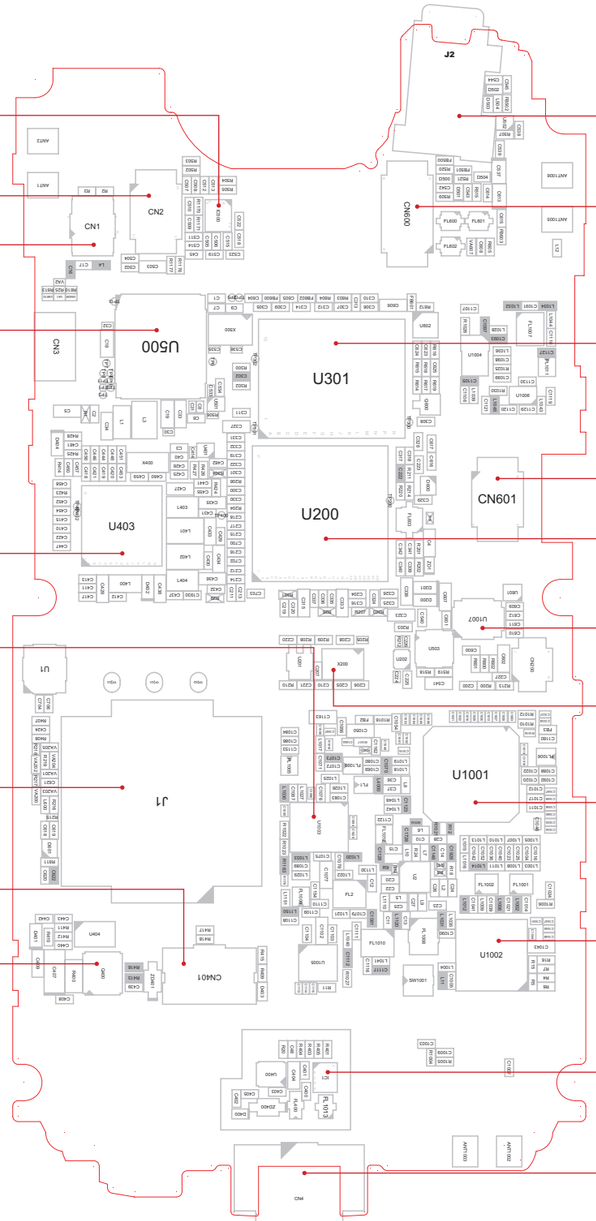
U403 : PMIC
- no Booting
- no Power On
- no Service

U403 : PMIC
- no Booting
- no Power On
- no Service

J1 : SIM Conn.
- No SIM

CN401 : Battery Conn.
- no power On

Q400 : Charging IC
- no Battery Charge



J2 : 3.5pi Ear-Jack
- no Sound

CN600 : 3M Camera DOP Connector
- no Camera

U301 : Memory
- no Booting

CN601 : LCD Conn.
- no Display

U200 : DBB
- no Power On
- no Servive

U1007 : ChargePump
- no LCD backlight

X200 : 19.2Mhz X-tal
- no Power On
- no Service

U1001 : Transceiver
- no Service
- RF Sensitivity & TX Power

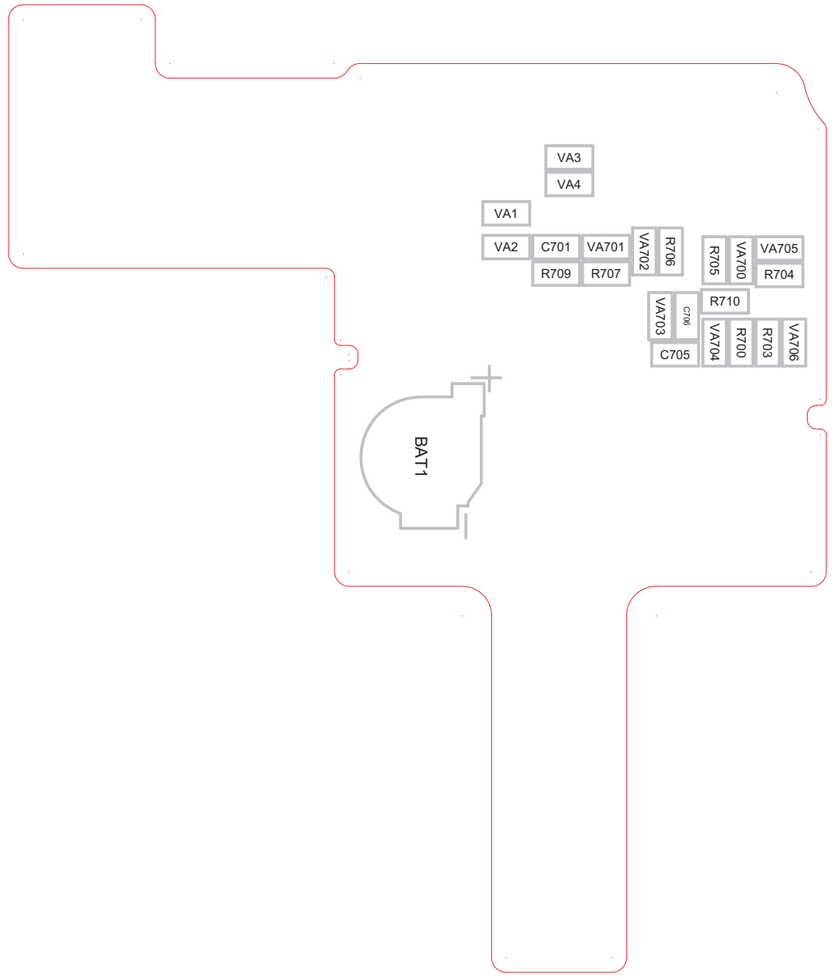
U1002 : FEM&GSM PAM
- no Service
- RF Sensitivity & TX Power

IC1 : MUIC
- no Booting
- no USB/Serial Connection

CN4 : I/O conn.
- no USB Connection.
- no Serial Connection.

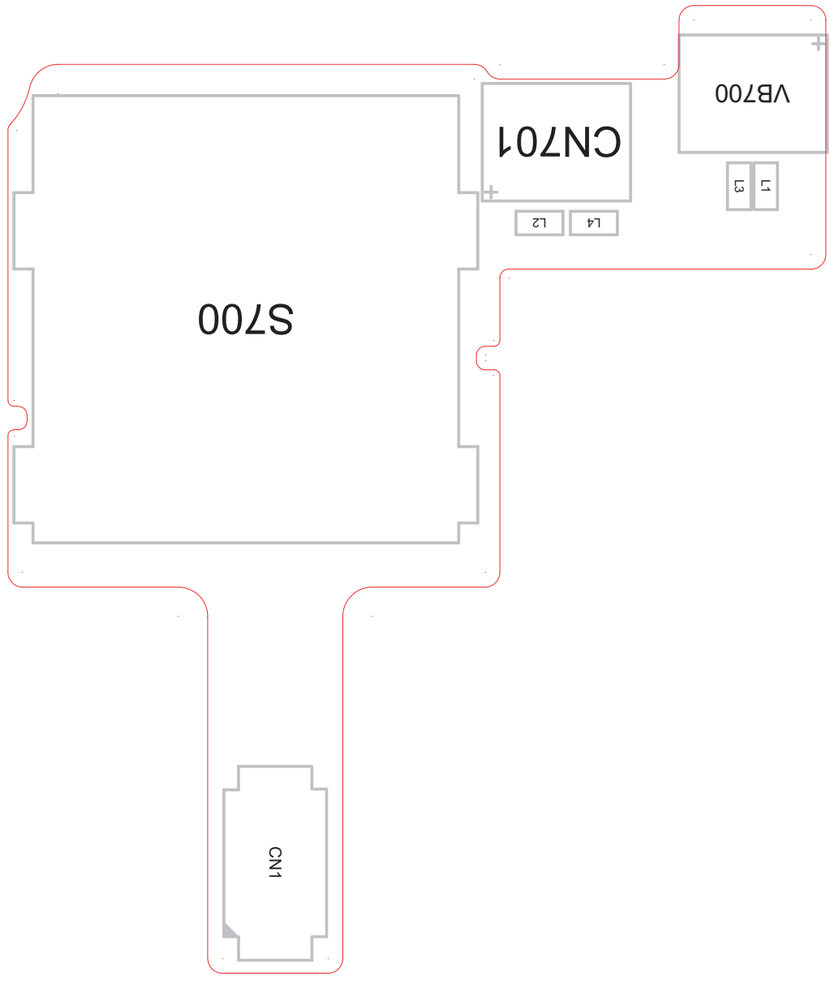
LG-P500_MAIN_SPFY0233701-1.1_PLACE_BOT

9. PCB LAYOUT



LG-P500_F_SUB_SPCY0242301-1.1_TOP

9. PCB LAYOUT

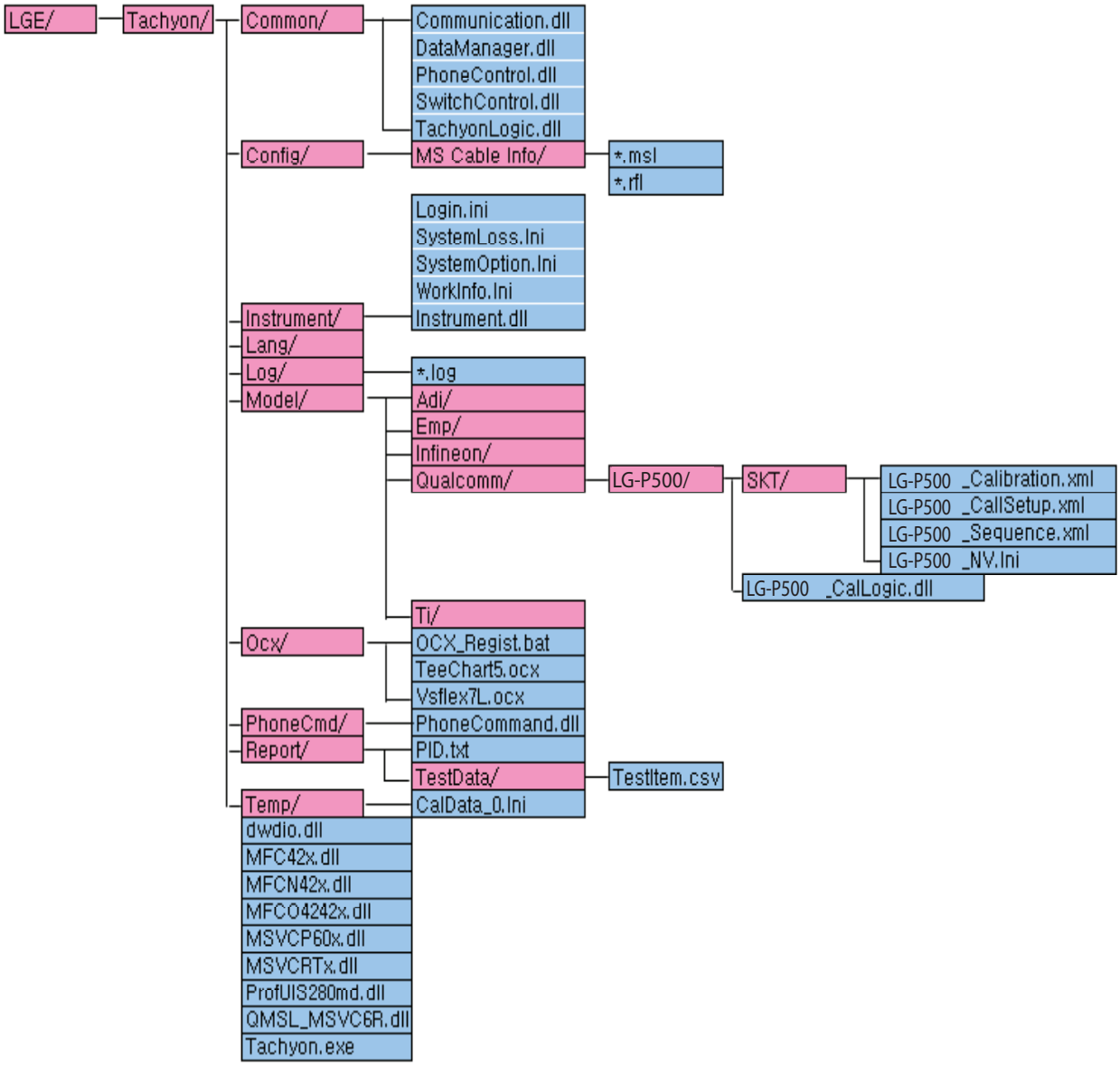


LG-P500_F_SUB_SPCY0242301-1.1_BOT

10. RF CALIBRATION

10.1 Configuration of Tachyon

10.1.1 Configuration of directory



10.1.2 Description of basic folders

Folder	Description
Tachyon	Exe file and MFC dll, UI dll is present.
Common	Common dll files. (XML Data I/O , Auto Test Logic, Tachyon Logic Control, Communication)
Config	Envirement files. (Port configuration, Loss adjust)
Instrument	Tester control dll.
Model	Model files is present. (Model -> Solution (Qualcomm, EMP, ADI, INFINEON) -> MODEL NAME(LGGW620, LGSH470, ..) -> BUYER NAME(SKT, TEL, VIVO, …)
OCX	Conponent files.
PhoneCmd	Phone communication file
Report	Report Files is present. (Cal data, test data)

10.1.3 Description of configuration files

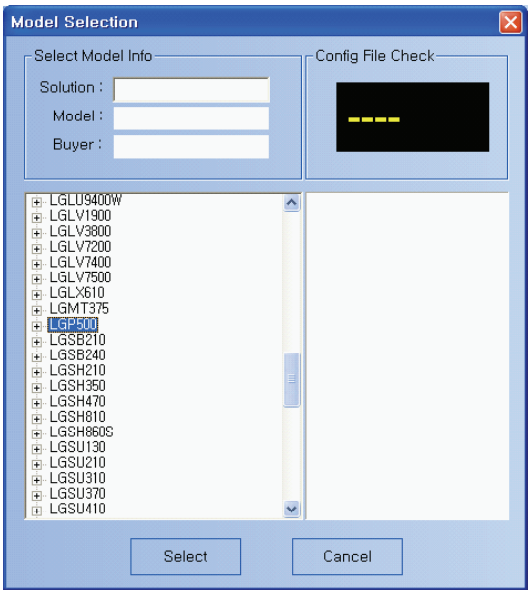
File	Description
'MODEL NAME'_Calibration.XML	There are imformations to calibrate. It consist of calibration items.
'MODEL NAME'_CallSetup.XML	There are imformations to call.
'MODEL NAME'_NV.INI	It consists of default values. It is written when 'cal&auto' is begun.
'MODEL NAME'_Sequence.XML	It is described a testing procedures.

10.2 How to use Tachyon

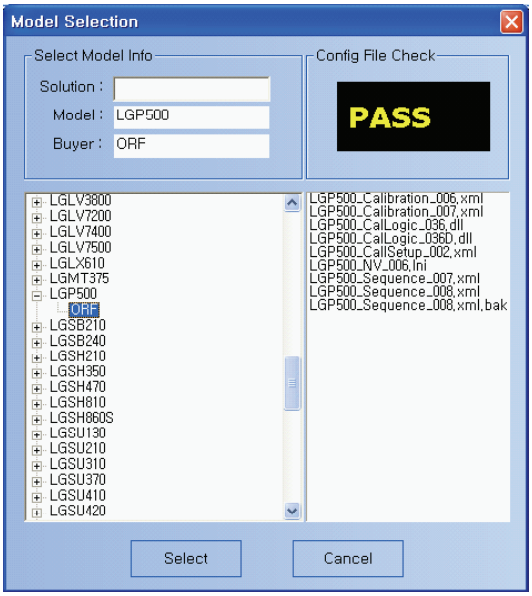
10.2.1 Model selection

Follow the procedure before start calibration & auto test

a. Click the icon,  in tool bar. Then, you can see the below screen.



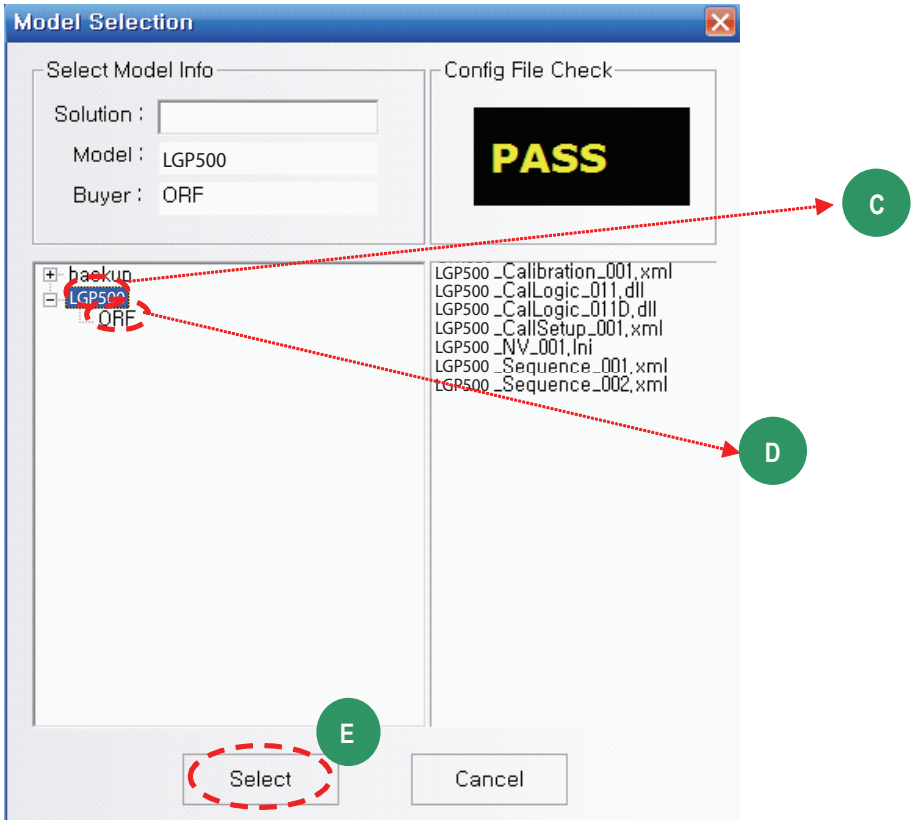
b. Select Model "LGP500"



c. Select the model : You should select "LGP500"

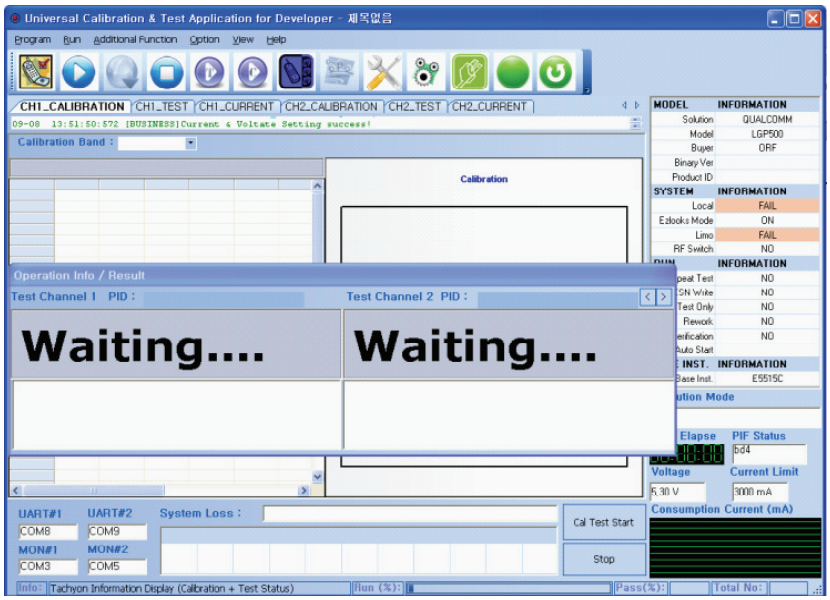
d. Select the buyer (must be double clicked) Then, you can see "PASS" in Config File Check.

e. Click select button



10.2.2 Start cal & auto

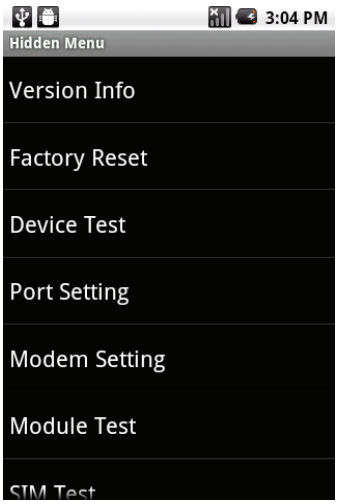
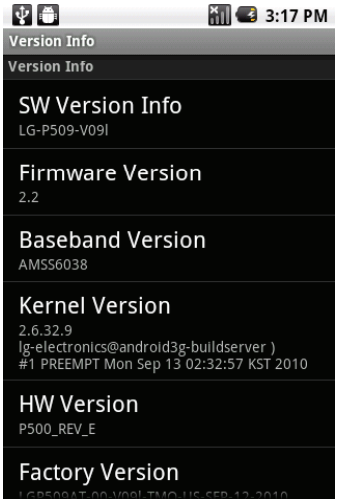
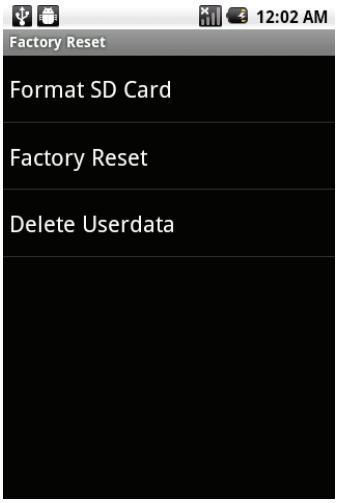
a. Click calibration & autotest button,  in Tool bar.

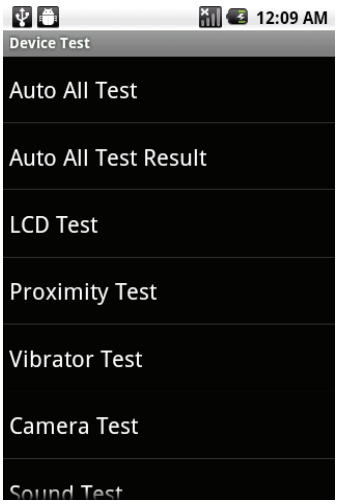
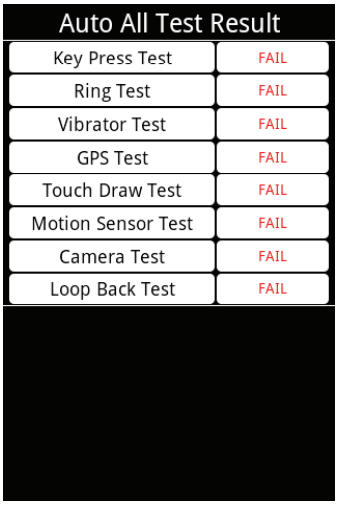
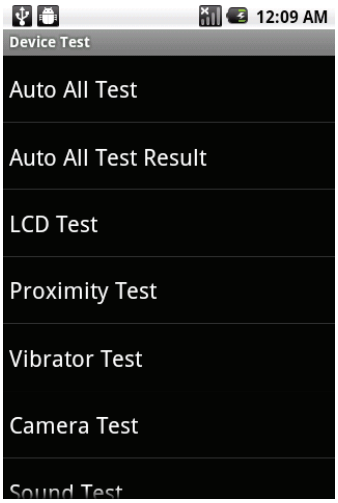


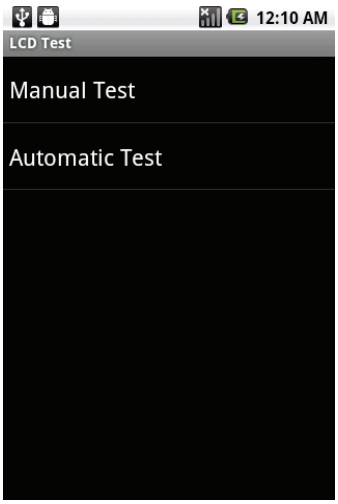
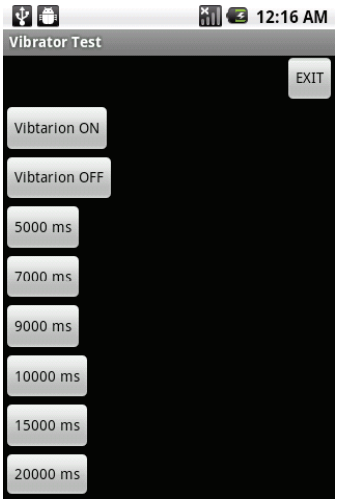
b. Calibration & autotest will be executed in order.

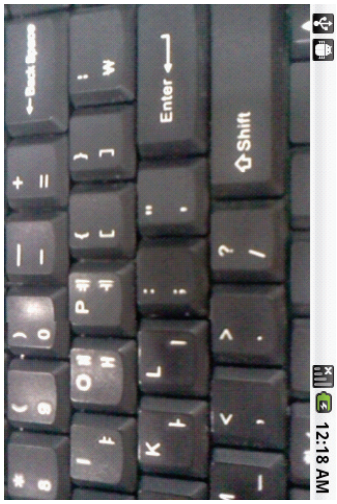
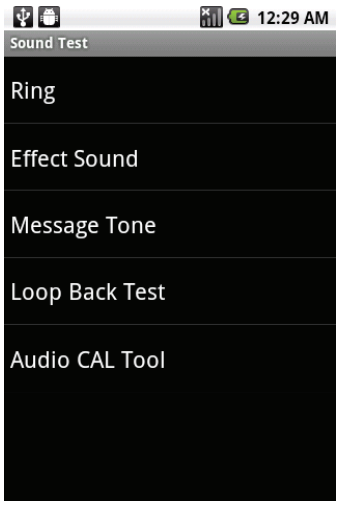
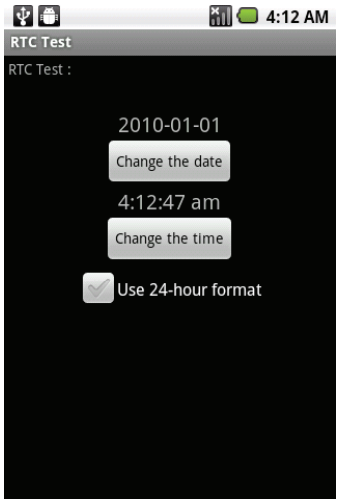
1) Precede Action.
   - NV write
   - Test command send.
2) Calibration
3) Auto test
4) After action
   - Phone reset
   - Change UE to AMSS

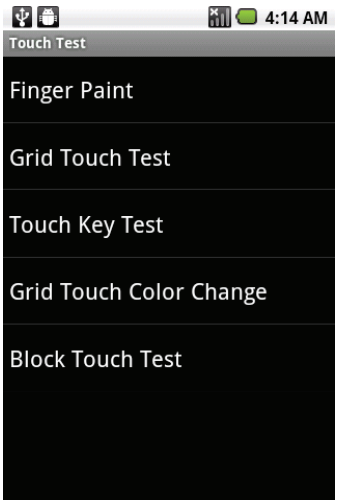
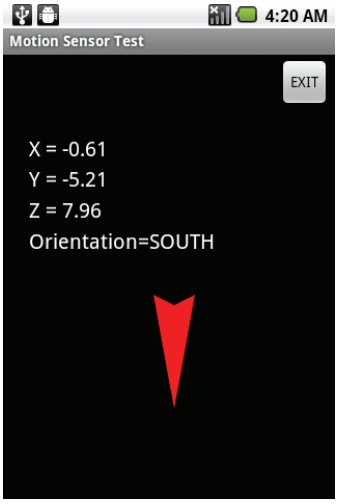
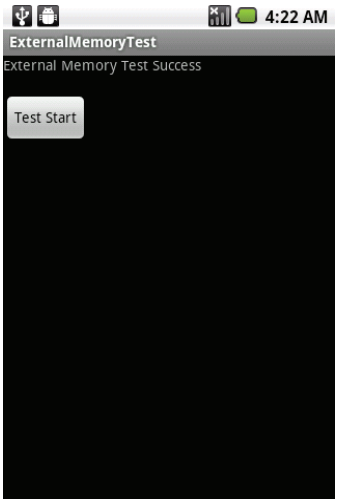
11. STAND ALONE TEST

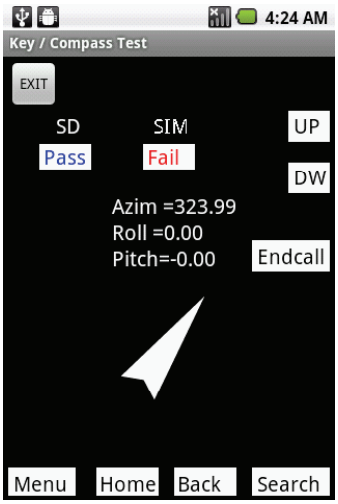
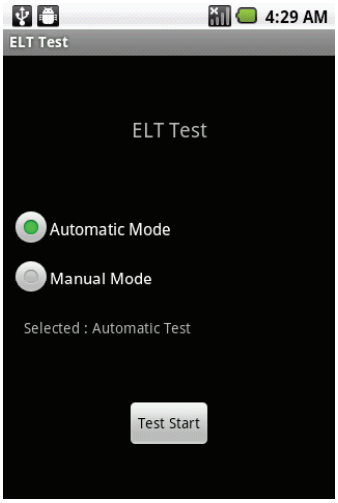
	**Hidden Menu Start** Start shortcut keys: 3845#*500# **Hidden Menu List** Start the desired menu: Menu, click
	**Version Info** Classified Information representation
	**Factory Reset** Format SD Card : SD Card Data reset Factory Reset : Changing the Factory Delete Userdata : Disabled

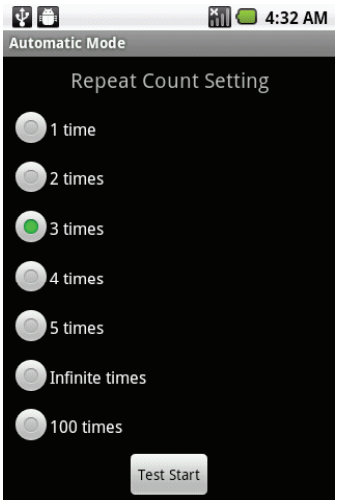
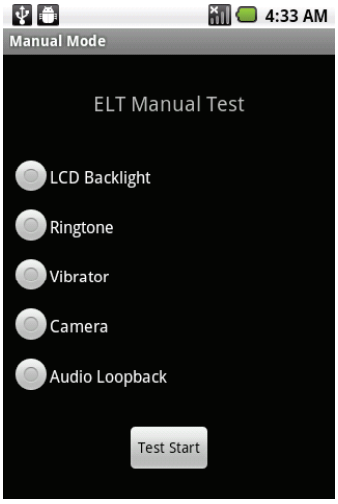
	**Device Test List** Auto All Test : -> Auto All Test menu click -> Continuous information on the menu, giving you ability test
	**Auto All Test Result** Auto All Test Result -> From the factory with the ability to view the results screen
	**Device Test List** Auto All Test : Device functionality testing at the factory to use Auto All Test Result : Test Result LCD Test : Display test(Color) Proximity Test : Proximity Sensor Vibrator Test : Vibrator test Camera Test : Camera & Cam test Sound Test : Sound test RTC Test : Date/Time Setting Touch Test : Display touch test Motion Sensor test : Motion Sensor test External Memory Test : SD Card Write test Compass Test : Compass Test GPS Test : GPS Test IRT Test : N/A

	**LCD Test List** Manual Test : Click on the following screen Automatic Test : Automatically, without clicking - White Display - Black Display - Red,Green, Blue, White Display - Red,Green, Blue, White Display 2
	**Proximity Test** Phone contact with your fingers in the top of the sensor determine the sensor response - Away 1 - Near 0
	**Vibrator test** A case-by-state vibration tests

	**Camera test** Menu features disabled This feature is part of Auto All Test replaced by -> Auto All Test -> Camera test -> Cam test
	**Sound test** Ring : Ringtone test Effect Sound : Message Tone : Loop Back test : Mic & Speak loop Back test Audio CAL Tool : Setting -> Ring menyujung Enabled
	**RTC test** Date & time : setting

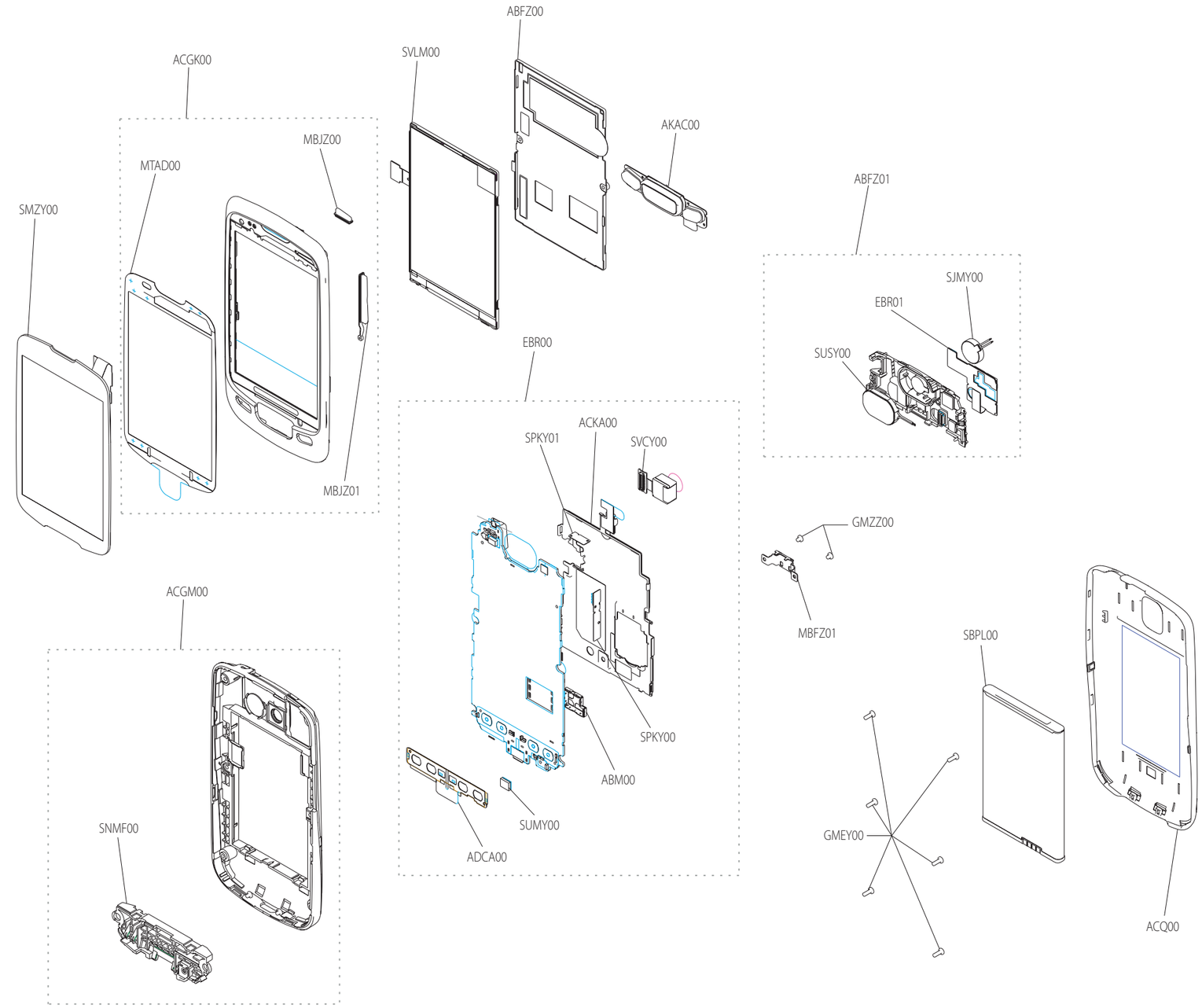
	**Touch test** Finger Print : Free mode test Grid Touch Test : Block mode on touch point mode test Touch Key Test : key test Grid Touch Color Change Block Touch Test
	**Motion Sensor test** Motion Sensor test -> 4 Check the operation of the sensor in the direction of lean
	**External Memory Test** SD Card test -> Write a test check of the SD Card memory

	**Key / Compass Test** SD Card : Check Recognition SIM Card : Check Recognition Up/Down key : Check Recognition End Call key : Check Recognition Menu key : Check Recognition Home key : Check Recognition Back key : Check Recognition Search key : Check Recognition Compass test
	**GPS Test** GPS test : GPS check recognition
	**ELT Test** Automatic Mode Manual Mode :

	**ELT Test** Automatic Mode : LCD Automatic on/off test -> time setting
	**ELT Manual Test** LCD Backlight Ringtone Vibrator Camera Audio Loopback -> test on the device is working (The ability to use plant)

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.1 EXPLODED VIEW



No	Part Name
SBPL00	Rechargeable Battery,Lithium Ion
ACQ00	Cover Assembly,Battery
MBFZ01	Bracket
GMZZ00	SCREW MACHINE
GMEY00	Screw,Machine
SUMY00	Microphone,Condenser
ABM00	Can Assembly,Shield
SPKY01	PCB,Sidekey
SVCY00	Camera Module
ADCA00	Dome Assembly,Metal
ACKA00	Can Assembly,Shield
SPKY00	PCB,Sidekey
EBR00	PCB Assembly,Main
ABFZ00	Bracket Assembly
SVLM00	LCD,Module-TFT
AKAC00	Keypad Assembly,Main
SMZY00	Touch Window Assembly
MTAD00	Tape,Window
MBJZ01	Button
MBJZ00	Button
ACGK00	Cover Assembly,Front
SNMF00	Antenna,Helical
ACGM00	Cover Assembly,Rear
SUSY00	Speaker Module
EBR01	PCB Assembly,Flexible
SJMY00	Motor,DC
ABFZ01	Bracket Assembly

12.2 ReplacementParts <Mechanic component>

Note:ThisChapterisusedforreference,Partorderisordered bySBOMstandardonGCSC

Level	LocationNo.	Description	PartNumber	Spec	Remark
1	AAD000000	AdditionAssembly	AAD85593202☞7	LGP500.ADEUBIBI:BLUESILVER-	
2	AFN053800	ManualAssembly, Operation	AFN75252805☞2	LGP500.ADEUBIZZ:WithoutColor-	
3	MBM087200	Card,Warranty	MCDF0001110	COMPLEXKP202VDGZZ:WithoutColorPRINTING,(empty),	
3	MFL053800	Manual,Operation	MMBB0393906	COMPLEXLGP500.ADEUBIZZ:WithoutColorPRINTING,(empty),	
1	AGQ000000	PhoneAssembly	AGQ86310402	LGP500.ADEUBIBI:BLUESILVER-	
2	ACQ100400	CoverAssembly, EMS	ACQ85321902	LGP500.ADEUBIBI:BLUESILVER-	
5	ABM070300	CanAssembly, Shield	ACKA0032401☞5	LG-P500ORFZZ:WithoutColor-	
6	MCBA00	Can,Shield	MCBA0089101	COMPLEXLG-P500ORFZZ:WithoutColorPRESS,STS,,,,,	
6	MCQ000000	Damper	MCQ66465901	COMPLEXLGP500.AORFBKBK:Black-	
6	MEZ000900	Label,AfterService	MLAB0006701	COMPLEXGS505TMOZZ:WithoutColorCOMPLEX,(empty),,,,,	
6	MTAZ01	Tape	MTAZ0347201	COMPLEXLG-P500ORFZZ:WithoutColorCOMPLEX,(empty),,,,,	
6	MTAZ00	Tape	MTAZ0366501	COMPLEXLG-P500ORFZZ:WithoutColorCOMPLEX,(empty),,,,,	
5	ADB048600	DomeAssembly, Metal	ADCA0117901	LG-P500ORFZZ:WithoutColor-	
5	MDJ000000	Filter	MFBZ0031701	COMPLEXLG-P500ORFZZ:WithoutColorCOMPLEX,(empty),,,,,	
6	SC2	CanAssembly, Shield	ABM73436401☞2	LGP500.AORFZYZZ:WithoutColor-	
7	MBK070300	Can,Shield	MCBA0103101	COMPLEXLG-P500ORFZZ:WithoutColorPRESS,Ni,	
7	MDQ000000	Frame	MFEZ0045301	COMPLEXLG-P500ORFZZ:WithoutColorPRESS,Ni,	
5	MEZ000000	Label	MLAZ0038301	COMPLEXLG-VX6000ZZ:WithoutColorPIDLabel4ArrayPRINTING,	
1	AGF000000	PackageAssembly	APAY0151808☞7	LGP500.ADEUSVZZ:WithoutColorEU1W_LGP500_ENG_ENGOPEN	
2	AGJ000000	PalletAssembly	APLY0003901☞3	GD510BALBKZZ:WithoutColorEU1TYPE_Body(SW)+Cap(EU)+AL_1200EA	
3	MBEC00	Box,Carton	MBEC0003601	COMPLEXGD510CZESVZZ:WithoutColor-	
3	MCCL00	Cap,Box	MCCL0002501	COMPLEXGD510CZESVZZ:WithoutColor-	
3	MPCY00	Pallet	MPCY0012403	COMPLEXKG800FRABKDB:DARKBLUE-	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	LocationNo.	Description	PartNumber	Spec	Remark
2	MAF086500	Bag,Vinyl	MBAD0005204	COMPLEXLG-LX260SPRAGZZ:WithoutColor-	
2	MAY047100	Box,Master	MBEE0061001	COMPLEXGD510CZESVZZ:WithoutColor-	
2	MAY084000	Box,Unit	MBEF0150301	COMPLEXLG-P500DEUBIZZ:WithoutColorPRINTING,EU1W_LG-P500_ENG_ENGOpen_EU	
2	MEZ003500	Label,Barcode	MLAC0004541	COMPLEXHB620KPNBKZZ:WithoutColor-	
2	MEZ047200	Label,MasterBox	MLAJ0004402	COMPLEXCG300CGRZZ:WithoutColorLABEL,MASTERBOX (forCGRTDR2VER.mbox_label)	
2	MEZ000001	Label	MLAZ0050901	COMPLEXKU990GBRBKZZ:WithoutColor-	

12.2 ReplacementParts <Main component>

Note:ThisChapterisusedforreference,Partorderisordered bySBOMstandardonGCSC

Level	LocationNo.	Description	PartNumber	Spec	Remark
3	EBR071900	PCBAssembly,Main	EBR72743702☞2	LGP500.ADEUBIMAIN1.0	
4	EBR071500	PCBAssembly,Main,Insert	EBR72701401☞6	LG-P500MAIN1.0	
5	EAX010501	PCB,Sidekey	SPKY0093201	SPKY0093201POLYIDoubleDOUBLE0.15LG-P500TMO,SIDEKEY,E,POLYI,0.15mm,DOUBLELGInnotek.com	
5	EAX010500	PCB,Sidekey	SPKY0093401	SPKY0093401POLYIDoubleDOUBLE0.15LG-P500TMO,SIDEKEY,E,POLYI,0.15mm,DOUBLELGInnotek.com	
5	EBP000000	CameraModule	SVCY0024801	C3AA-Y314BC3AA-Y314B3MAF,Sony(1/5"),8.5x8.5x5.4t,FPCB3.5mm,90degreeLGINNOTEKCO.,LTD	
4	EBR071800	PCBAssembly,Main,SMT	EBR72743802☞4	LGP500.ADEUBIMAIN1.0	
5	SAFC	PCBAssembly,Main,SMTBottom	EBR72701201☞200	LG-P500MAIN1.0	
6	C7	Capacitor,Ceramic,Chip	ECCH0000109	MCH155A080DK8pF0.25PF50VNP0-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C1119,C1120,C23,C27,C459,C460	Capacitor,Ceramic,Chip	ECCH0000110	MCH155A100D10pF0.25PF50VNP0-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C1003,C1088	Capacitor,Ceramic,Chip	ECCH0000112	MCH155C150J15pF5%50VNP0-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C1079,C1098	Capacitor,Ceramic,Chip	ECCH0000113	MCH155A180J18pF5%50VNP0-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C24,C402,C403	Capacitor,Ceramic,Chip	ECCH0000115	MCH155A220JK22pF5%50VNP0-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C1024,C502	Capacitor,Ceramic,Chip	ECCH0000120	MCH155A390J39pF5%50VNP0-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C1091,C17,C200,C505,C506,C542,C543,C545	Capacitor,Ceramic,Chip	ECCH0000122	MCH155A470JK47pF5%50VNP0-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C1076,C207,C210,C221	Capacitor,Ceramic,Chip	ECCH0000137	C1005X7R1H331KT000F0.33nF10%50VX7R-55TO+125C1005R/TP-TDKKOREACOOPERATION	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	C1,C1075, C1104, C205,C317, C319,C324, C328,C332, C337,C342, C425,C426, C429,C430, C431,C432, C437	Capacitor,Ceramic,Chip	ECCH0000143	MCH155CN102KK1nF10%50VX7R-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C204	Capacitor,Ceramic,Chip	ECCH0000147	MCH155CN222KK2.2nF10%50VX7R-55TO+125C1005R/TP-ROHM.	
6	C1130,C20, C208,C309, C316,C318, C320,C331, C336,C340, C408,C440, C48,C625, C704	Capacitor,Ceramic,Chip	ECCH0000155	MCH153CN103KK10nF10%16VX7R-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C509,C510	Capacitor,Ceramic,Chip	ECCH0000161	MCH153CN333KK33nF10%16VX7R-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C1089, C26	Capacitor,Ceramic,Chip	ECCH0000180	GRM1555C1H3R3C3.3pF0.25PF50VNP0-55TO+125C1005R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C400,C401	Capacitor,Ceramic,Chip	ECCH0000182	GRM155R61A104K0.1uF10%10VX5R-55TO+85C1005R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C1084	Capacitor,Ceramic,Chip	ECCH0000185	GRM1555C1H5R6C5.6pF0.25PF50VNP0-55TO+125C1005R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C1069, C1080	Capacitor,Ceramic,Chip	ECCH0000195	GRM1555C1H3R9C3.9pF0.25PF50VNP0-55TO+125C1005R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C3,C307, C312,C314, C424,C444, C446,C447, C448,C450, C451,C454, C455,C456, C515,C518, C519,C522, C523,C539, C6,C609, C610,C612, C616,C617, C9	Capacitor,Ceramic,Chip	ECCH0000198	CL05A225MQ5NSNC2.2uF20%6.3VX5R-55TO+85C1005R/TP.SAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C1004, C1016	Capacitor,Ceramic,Chip	ECCH0000901	C1005C0G1H2R2CT000F2.2pF0.25PF50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	
6	C1078, C1107	Capacitor,Ceramic,Chip	ECCH0001001	C1005C0G1H6R8CT000F6.8pF0.5PF50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	
6	C1099	Capacitor,Ceramic,Chip	ECCH0002001	C1005JB0J104KT000F0.1uF10%6.3VY5P-30TO+85C1005R/TP-TDKCORPORATION	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	C211,C213, C306,C311, C313,C40, C45,C457, C461,C600, C601,C614	Capacitor,Ceramic,Chip	ECCH0004904	GRM155R60J105K1uF10%6.3VX5R-55TO+85C1005R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C1102, C602,C607	Capacitor,Ceramic,Chip	ECCH0005602	GRM188R61C225K2.2uF10%16VX5R-55TO+85C1608R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C1050, C1077, C1163, C18,C19	Capacitor,Ceramic,Chip	ECCH0005604	GRM188R60J106M10000000pF,6.3V,M,X5R,TC,1608,R/TP,0.8mmMURATAMANUFACTURINGCO.,LTD.	
6	C33,C34, C606	ChipCeramicCapacitor(MLCC)	ECCH0006201	C1608X5R0J475KT000N4.7uF10%6.3VX5R-55TO+85C1608R/TP-TDKCORPORATION	
6	C4,C433, C434,C435, C436,C5	Capacitor,Ceramic,Chip	ECCH0007802	CV105X5R475M10AT4.7uF20%10VX5R-55TO+85C1608R/TP-KYOCERACORP.	
6	C1043, C323,C327, C333,C338, C409,C427, C428,C438, C503,C541	Capacitor,Ceramic,Chip	ECCH0007803	CL10A106MP8NNNC10uF20%10VX5R-55TO+85C1608R/TP0.8MMSAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C534	Capacitor,Ceramic,Chip	ECCH0007804	CL05A225MP5NSNC2.2uF20%10VX5R-55TO+85C1005R/TP0.5MMSAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C1028, C1030, C1032, C1034, C1038, C1049, C1053, C1055, C1057, C1058, C1059, C1060, C1061, C1062, C1063, C1066, C1067, C224,C30, C31,C32	Capacitor,Ceramic,Chip	ECCH0009101	C0603X5R0J104KT00NN0.1uF10%6.3VX5R-55TO+85C0603R/TP-TDKCORPORATION	
6	C1065, C1068, C1094, C1095, C1096, C1113, C1114, C1115, C1929	Capacitor,Ceramic,Chip	ECCH0009103	C0603C0G1H101JT00NN100pF5%50VX7R-55TO+125C0603R/TP-TDKCORPORATION	
6	C1013, C1015	ChipCeramicCapacitor(MLCC)	ECCH0009106	C0603X7R1C103KT10nF10%16VX7R-55TO+125C0603R/TP-TDKCORPORATION	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	C226	Capacitor,Ceramic,Chip	ECCH0009203	GRM033R60J333K33nF10%6.3VX5R-55TO+85C0603R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C1010, C1019	ChipCeramicCapacitor(MLCC)	ECCH0009206	GRM0335C1E680J68pF5%25VX7R-55TO+125C0603R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C1027, C1029, C1031, C1033, C1064	Capacitor,Ceramic,Chip	ECCH0009216	GRM0335C1E220J22pF5%25VX7R-55TO+125C0603R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C223	Capacitor,Ceramic,Chip	ECCH0010501	GRM1555C1H7R5D7.5pFC0GTYPE(NoX7R)MURATAMANUFACTURINGCO.,LTD.	
6	C533,C536, C8	Capacitor,Ceramic,Chip	ECCH0017301	CL03A105MQ3CSNH1000000pF,6.3V,M,X5R,HD,0603,R/TP,1,20%,6.3V,X5R,-55TO+85C,0603,R/TP,0.3mmSAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C315	Capacitor,Ceramic,Chip	ECCH0017501	CL10A226MQ8NRNE22uF20%6.3VX5R-55TO+85C1608R/TP0.8MMSAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C1054, C1056, C1160, C1162, C308,C452, C453,C604, C605,C611	Capacitor,Ceramic,Chip	ECCH0017601	CL05A475MQ5NRNC4.7uF20%6.3VX5R-55TO+85C1005R/TP0.5MMSAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C407	Capacitor,TA, Conformal	ECTH0002703	TCTAL1A107M8R0.0001F20%10V50UA-55TO+125C0OHM3.2x1.6x1.1NONESMDR/TPROHMCO.,LTD.	
6	C613	Capacitor,TA, Conformal	ECTH0003701	TCSCM0J106MJAR10uF,6.3V,M,L_ESR,1608,R/TPSAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C537	Capacitor,TA, Conformal	ECTH0004801	TCM0J106M8R10uF,6.3V,M,STD,1608,R/TPROHM.	
6	R1005	Capacitor,Ceramic,Chip	ECZH0000802	C1005C0G1H010CT1pF0.25PF50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	
6	C1011, C1012, C1129, C12,C13, C14,L1015, L1039,L12	Capacitor,Ceramic,Chip	ECZH0000813	C1005C0G1H101JT100pF5%50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	
6	C1090,C28,L1025	Capacitor,Ceramic,Chip	ECZH0000816	C1005C0G1H120JT000F12pF5%50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	
6	C36,C37	Capacitor,Ceramic,Chip	ECZH0000822	C1005C0G1H1R5CT000F1.5pF0.25PF50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	C1005, C1014, C1017, C1021, C1022, C1039, C1041, C1071, C1072, C1087, C1103, C1118, C1121, C225,C412, C538,C544, C608,C618, C619,C621, C622,C700, C702,C703	Capacitor,Ceramic,Chip	ECZH0000830	C1005C0G1H330JT000F33pF5%50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	
6	C1023, C1025	Capacitor,Ceramic,Chip	ECZH0000839	C1005C0G1H4R7CT000F4.7pF0.25PF50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	
6	C1007	Capacitor,Ceramic,Chip	ECZH0000841	C1005C0G1H560JT000F56pF5%50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	
6	L1011	Capacitor,Ceramic,Chip	ECZH0001002	C1005CH1H0R5BT000F0.5pF0.1PF50VNP0-55TO+125C1005R/TP-TDKKOREACOOPERATION	
6	C1930, C405,C442, C443,C504, C507,C508, C511,C514	Capacitor,Ceramic,Chip	ECZH0001215	C1005X5R1A105KT000F1uF10%10VX5R-55TO+85C1005R/TP-TDKKOREACOOPERATION	
6	C706	Capacitor,Ceramic,Chip	ECZH0001217	GRM155R60J474K470nF10%6.3VX5R-25TO+70C1005BK-DUP-MURATAMANUFACTURINGCO.,LTD.	
6	C2,C206, C212,C214, C215,C216, C217,C218, C219,C220, C227,C300, C301,C305, C310,C322, C325,C326, C329,C330, C335,C339, C341,C410, C411,C413, C415,C417, C418,C419, C420,C421, C422,C439, C441,C458, C512,C513, C540,C615, C620,C623, C624	Capacitor,Ceramic,Chip	ECZH0003103	GRM36X7R104K10PT100nF10%10VX7R-55TO+125C1005R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C404	Capacitor,Ceramic,Chip	ECZH0003503	GRM188R61E105K1uF10%25VX5R-55TO+85C1608R/TP-MURATAMANUFACTURINGCO.,LTD.	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	C1046	Capacitor,Ceramic,Chip	ECZH0025916	GRM0335C1E330J33pF5%25VNP0-55TO+125C0603R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C1044	Capacitor,Ceramic,Chip	ECZH0025917	GRM0335C1E470J47pF5%25VNP0-55TO+125C0603R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C1018, C1037, C1045, C1047, C1048, C1051, C414,C535	Capacitor,Ceramic,Chip	ECZH0025920	GRM033R71C102K1nF10%16VX7R-55TO+125C1608R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	D200,D201, D401,D404	Diode,Switching	EDSY0010501	KDS114E900mV30V100mA1A0SEC100mWESCR/TP2P1KECCORPORAITION	
6	D402	Diode,Switching	EDSY0011901	SDB310Q340mV30V200mA1A0SEC150mWEMD2R/TP2P1AUKCORP	
6	ZD401	Diode,TVS	EDTY0008601	PSD05-LF5V613.5V42A500WSOD323R/TP2P1PROTEKDEVICESINC.	
6	ZD400	Diode,TVS	EDTY0008602	PSD12-LF12V13.325.9V21A500WSOD323R/TP2P1PROTEKDEVICESINC.	
6	D403	Diode,TVS	EDTY0008606	PRSB6.8C4.7V5.7--10W-R/TP2P1PROTEKDEVICESINC.	
6	D600,D601	Diode,TVS	EDTY0009801	VSMF05LCC5V6V12V2A25WSOT-963R/TP6P5PROTEKDEVICESINC.	
6	D400,D500, D501,D502, D503,D504, ZD1	Diode,TVS	EDTY0010101	ESD9B5.0ST5GESD9B5.0ST5G,SOD-923,5V,300mW,R/TP,15pFSCGHONGKONGSARLTD.	
6	C1092, R1004	Inductor,Multilayer, Chip	ELCH0001033	HK10051N5S-T1.5NH0.3NH0V8A13GOHM50mHZ300mNONSHIELD11.0X0.5X0.5MMR/TPTAIYOYUDENCO.,LTD	
6	C1153	Inductor,Multilayer, Chip	ELCH0001035	HK10054N7S-T4.7NH0.3NH0V8A6GOHM120mHZ300mNONSHIELD11.0X0.5X0.5MMR/TPTAIYOYUDENCO.,LTD	
6	C1036, C1040, L1021, L1028, L1029	Inductor,Multilayer, Chip	ELCH0001036	HK10055N6S-T5.6NH0.3NH0V8A5.7GOHM150mHZ300mNONSHIELD11.0X0.5X0.5MMR/TPTAIYOYUDENCO.,LTD	
6	C1009, L1022	Inductor,Multilayer, Chip	ELCH0001048	1005GC2T10NJLF10NH5%0V250mA0.42OHM2.5GHZ8NONSHIELD11.0X0.5X0.5MMR/TPPILKORELECTRONICSLTD.	
6	L1035,L6	Inductor,Multilayer, Chip	ELCH0001056	1005GC2T2N7SLF2.7NH0.3NH0V300mA0.17OHM5.5GHZ8NONSHIELD11.0X0.5X0.5MMR/TPPILKORELECTRONICSLTD.	
6	L1027	Inductor,Multilayer, Chip	ELCH0001405	LL1005-FHL3N3SLL1005-FH3N3S,3.3nH,S,1005,R/TP,TOKO,INC.	
6	L9	Inductor,Multilayer, Chip	ELCH0001409	LL1005-FHL10NJ10NH5%0V400mA0.3OHM3.6GHZ9NONSHIELD11.0X0.5X0.5MMR/TPTOKO,INC.	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	L1018, L1019	Inductor,Multilayer, Chip	ELCH0001412	LL1005-FHL1N8S1.8NH0.3NH0V500mA0.14OHM12GHZ8NONSHIELD11.0X0.5X0.5MMR/TPTOKO,INC.	
6	L8	Inductor,Multilayer, Chip	ELCH0001413	LL1005-FHL22NJ22NH5%0V300mA0.7OHM2.1GHZ10NONSHIELD11.0X0.5X0.5MMR/TPTOKO,INC.	
6	L1003	Inductor,Multilayer, Chip	ELCH0001425	LL1005-FHL82NJ82NH5%0V200mA1.9OHM970MHZ10NONSHIELD11.0X0.5X0.5MMR/TPTOKO,INC.	
6	L1044	Inductor,Multilayer, Chip	ELCH0003816	LQG15HS3N6S02D3.6NH0.3NH0V300mA0.18OHM6GHZ8NONSHIELD11.0X0.5X0.5MMR/TPMURATAMANUFACTURINGCO.,LTD.	
6	L1013	Inductor,Multilayer, Chip	ELCH0003819	LQG15HS12NJ02D12NH5%0V300mA0.28OHM3GHZ8NONSHIELD11.0X0.5X0.5MMR/TPMURATAMANUFACTURINGCO.,LTD.	
6	C1086, C1106,L2	Inductor,Multilayer, Chip	ELCH0003838	LQG15HS8N2J028.2NH5%-300mA0.24OHM3.7KHZ8SHIELD11.0X0.5X0.55MMR/TPMURATAMANUFACTURINGCO.,LTD.	
6	L1017, L1043	Inductor,Multilayer, Chip	ELCH0003844	LQG15HS2N0S02LQG15HS2N0S02,2nH,S,1005,R/TP,Chip coilMURATAMANUFACTURINGCO.,LTD.	
6	C10,L1036,L7	Inductor,Multilayer, Chip	ELCH0004709	1005GC2T3N3S003.3NH0.3NH0V300mA0.19OHM4.5GHZ8NONSHIELD11.0X0.5X0.5MMR/TPPILKORELECTRONICSLTD.	
6	L1010, L1026	Inductor,Multilayer, Chip	ELCH0004711	1005GC2T22NJ0022NH5%0V200mA0.8OHM1.5GHZ8NONSHIELD11.0X0.5X0.5MMR/TPPILKORELECTRONICSLTD.	
6	C1042, C1052, L1032	Inductor,Multilayer, Chip	ELCH0004713	1005GC2T6N8J001005GC2T6N8J00,6.8nH,J,1005,R/TP,PILKORELECTRONICSLTD.	
6	L1004, L1005, L1007	Inductor,Multilayer, Chip	ELCH0004714	1005GC2T18NJ0018NH5%0V200mA0.65OHM1.6GHZ8NONSHIELD11.0X0.5X0.5MMR/TPPILKORELECTRONICSLTD.	
6	L1008	Inductor,Multilayer, Chip	ELCH0004717	1005GC2T82NJ0089NH5%0V150mA2.1OHM700MHZ8NONSHIELD11.0X0.5X0.5MMR/TPPILKORELECTRONICSLTD.	
6	L1016	Inductor,Multilayer, Chip	ELCH0004718	1005GC2T5N6S005.6NH0.3NH0V300mA0.27OHM3.2GHZ8NONSHIELD11.0X0.5X0.5MMR/TPPILKORELECTRONICSLTD.	
6	L1009, L1130	Inductor,Multilayer, Chip	ELCH0005005	HK100527NJ27NH5%0V8A2.3GOHM470mHZ300mNONSHIELD11.0X0.5X0.5MMR/TPTAIYOYUDENCO.,LTD	
6	C1083	Inductor,Multilayer, Chip	ELCH0005020	HK10051N0S1NH0.3NH0V8A13GOHM40mHZ300mNONSHIELD11.0X0.5X0.5MMR/TPTAIYOYUDENCO.,LTD	
6	L504	Inductor,Multilayer, Chip	ELCH0010402	LK1005R27-TLK1005R27-T,270nH,M,1005,R/TP,CHIPTAIYOYUDENCO.,LTD	
6	L3	Inductor,WireWound, chip	ELCP0008001	MIP2520D4R7M4.7UH30%0V1.1A0.11OHM0HZ0SHIELD2.5X2X1MMNONER/TPFDKCORPORATION.	
6	L403,L404	Inductor,WireWound, Chip	ELCP0008004	MIP2016D4R7M4.7UH30%0V900mA0.16OHM0HZ0SHIELD2.0X1.6X1.0MMNONER/TPFDKCORPORATION.	
6	L401,L402	Inductor,WireWound, Chip	ELCP0008005	CPI2520LZ4R7ME4.7UH20%0V900mA0.3OHM0HZ0SHIELD2.5X2X1MMNONER/TPSAMWHACAPACITORCO,LTD.	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	L400	Inductor,WireWound, Chip	ELCP0011901	CPI2012NHL2R2MT2.2UH20%-800mA0.25OHM--SHIELD2X1.25X1MMNONE-SAMWHACAPACITORCO,LTD.	
6	L1	Inductor,WireWound, Chip	ELCP0012101	CIG21L3R3MNE0H20%-800mA0.22OHM--SHIELD2X1.25X1MMNONE-SAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	CN2,CN601	Connector,BtoB	ENBY0034201	GB042-24S-H10-E300024P0.40MMSTRAIGHTSOCKETSMDR/TP1M-LSMtronLtd.	
6	CN600	Connector,BtoB	ENBY0040301	GB042-34S-H10-E300034P0.4MMSTRAIGHTSOCKETSMDR/TP1M-LSMtronLtd.	
6	CN200	Connector,BtoB	ENBY0045901	AXT61412414P0.4MMSTRAIGHTHEADERSMDR/TP1M-BJPANASONICELECTRONICPARTSCO.,LTD	
6	CN1	Connector,BtoB	ENBY0058601	51338-987310P0.40MMSTRAIGHTFEMALESMDR/TP1.5M-HANKOOKMOLEX	
6	J2	Jack,Phone	ENJE0007601	KJA-PH-0-01761P4PANGLER/TP4mMBLACK6P-KSDCO.,LTD	
6	CN4	Connector,I/O	ENRY0010501	GU075-5P-SD-E15005P0.65MMANGLERECEPTACLEDIPR/TP-LSMtronLtd.	
6	J1	CardSocket	ENSY0024701	GCA26C-8S-H15-E1500SIM8PANGLESMDR/TP-LSMtronLtd.	
6	SW1001	Connector,RF	ENWY0008701	MS-156CNONESTRAIGHTSOCKETSMDT/REELAU50OHM400mDBHIROSEKOREACO.,LTD	
6	CN401	Connector, TerminalBlock	ENZY0029201	04-9247-003-017-829+3,2.5mm,STRAIGHT,Gold,TwincontactKYOCERAELCOKOREASALESCO.,LTD.	
6	Q600	TR,Bipolar	EQBN0012401	KRC402ENPN30V0V50V100mA500mA50100mWESMR/TP3PKECCORPORAITION	
6	Q400	FET	EQFP0008601	NUS5530MNP-CHANNELMOSFET-20V20-3.9A0.07OHM1.3WTSOP6R/TP8PONSEMICONDUCTOR	
6	R214	Resistor,Chip	ERHY0000104	MCR01MZP5F49R949.9OHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R424	Resistor,Chip	ERHY0000105	MCR01MZP5F51R051OHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1030,R18	Resistor,Chip	ERHY0000137	MCR01MZP5F270227KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R428	Resistor,Chip	ERHY0000161	MCR01MZP5F2003200KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R2,R20, R3,R405, R504,R505, R614	Resistor,Chip	ERHY0000254	MCR01MZP5J4724.7KOHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R202,R216, R219,R414, R425,R615, R618	Resistor,Chip	ERHY0003201	MCR01MZP5F10011KOHM1%1/16W1005R/TP-ROHM.	
6	R205,R215, R217,R218	Resistor,Chip	ERHY0009503	MCR006YZPJ101100OHM5%1/20W0603R/TP-ROHMSemiconductorKOREACORPORATION	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	R1019	Resistor,Chip	ERHY0009504	MCR006YZPJ1021KOHM5%1/20W0603R/TP-ROHMSemiconductorKOREACORPORATION	
6	R506	Resistor,Chip	ERHY0009506	MCR006YZPJ104100KOHM5%1/20W0603R/TP-ROHMSemiconductorKOREACORPORATION	
6	R25,R610, R613	Resistor,Chip	ERHY0009541	MCR006YZPF4700470OHM1%1/20W0603R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1018	Resistor,Chip	ERHY0009555	MCR006YZPF120212KOHM1%1/20W0603R/TP-ROHMSemiconductorKOREACORPORATION	
6	R212	Resistor,Chip	ERHY0009592	MCR006YZPJ2022KOHM5%1/20W0603R/TP-ROHMSemiconductorKOREACORPORATION	
6	R206	Resistor,Chip	ERHY0024201	MCR01MZP5F60416040ohm,1/16W,F,1005,R/TPROHM.	
6	R415	Resistor,Chip	ERHZ0000203	MCR01MZP5F100210KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R210,R220, R300,R302, R612,R619	Resistor,Chip	ERHZ0000204	MCR01MZP5F1003100KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1176, R1177	Resistor,Chip	ERHZ0000206	MCR01MZP5F10R010OHM0.1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R426	Resistor,Chip	ERHZ0000222	MCR01MZP5F1503150KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R427	Resistor,Chip	ERHZ0000284	MCR01MZP5F4303430KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R410,R413	Resistor,Chip	ERHZ0000288	MCR01MZP5F4703470KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R616,R617	Resistor,Chip	ERHZ0000295	MCR01MZP5F510251KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R409	Resistor,Chip	ERHZ0000318	MCR01MZP5F806280.6KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1025, R509,R515	Resistor,Chip	ERHZ0000348	MCR01MZP5F12R012OHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	FB2,FB3	Resistor,Chip	ERHZ0000401	MCR01MZSJ0000OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1012	Resistor,Chip	ERHZ0000402	MCR01MZP5J10010OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1026	Resistor,Chip	ERHZ0000404	MCR01MZP5J1021KOHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R201,R203, R213,R408, R520,R521	Resistor,Chip	ERHZ0000405	MCR01MZP5J10310KOHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R602	Resistor,Chip	ERHZ0000406	MCR01MZP5J104100KOHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R605	Resistor,Chip	ERHZ0000410	MCR01MZP5J12012OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	R4,R5	Resistor,Chip	ERHZ0000415	MCR01MZP5J131130OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R411,R412	Resistor,Chip	ERHZ0000420	MCR01MZP5J151150OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1023	Resistor,Chip	ERHZ0000428	MCR01MZP5J18018OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	L600,R24	Resistor,Chip	ERHZ0000434	MCR01MZP5J1R01OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R502,R503	Resistor,Chip	ERHZ0000435	MCR01MZP5J20020OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R403,R404	Resistor,Chip	ERHZ0000437	MCR01MZP5J2022KOHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1006, R1170, R1171, R204,R401, R417,R418, R507,R518, R519,R603, R604	Resistor,Chip	ERHZ0000443	MCR01MZP5J2222.2KOHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1010	Resistor,Chip	ERHZ0000456	MCR01MZP5J2R22.2OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1022, R1163, R209	Resistor,Chip	ERHZ0000463	MCR01MZP5J33033OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R211,R6	Resistor,Chip	ERHZ0000483	MCR01MZP5J47047OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R600,R601	Resistor,Chip	ERHZ0000485	MCR01MZP5J4724.7KOHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	FB601, R407	Resistor,Chip	ERHZ0000488	MCR01MZP5J4R74.7OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R200	Resistor,Chip	ERHZ0000490	MCR01MZP5J51051OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R7	Resistor,Chip	ERHZ0000509	MCR01MZP5J75075OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R15,R16	Resistor,Chip	ERHZ0000517	MCR01MZP5J91091ohm,1/16W,J,1005,R/TPROHMSemiconductorKOREACORPORATION	
6	R611	Resistor,Chip	ERHZ0000530	MCR01MZP5J5125.1KOHM5%1/16W1005R/TP-ROHM.	
6	R416	Resistor,Chip	ERHZ0000537	MCR01MZP5F6803680KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R400	Resistor,Chip	ERHZ0003901	MCR10EZHFLR1000.1OHM1%1/4W2012R/TP-ROHM.	
6	R423	Resistor,Chip	ERHZ0004201	MCR01MZP5F1213121KOHM1%1/16W1005R/TP-ROHM.	
6	U201	IC,MCP,NOR	EUSY0216301	NC7SV00P5X_NLSC70,5PIN,R/TP,Single2-InputNANDGateFAIRCHILDSEMICONDUCTOR	
6	U404	IC,A/DConverter	EUSY0242303	MAX17040GDFN,8,R/TP,Fuelgauge,IC,CMOSIC,CMOSMAXIMINTEGRATEDPRODUCTSINC.	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	U403	IC,PMIC	EUSY0342201	PM7540-0.5~18N/A0WCSPR/TP137P-QUALCOMMINCORPORATED.	
6	U1001	IC,Tx/Rx	EUSY0344001	RTR62851.8VTO3V,2.7VTO3V500mWQFNR/TP68P-QUALCOMMINCORPORATED.	
6	U2	IC,RFAmplifier	EUSY0365001	BGA735-0.3~3.62.7-3.0NA0W0WNA0TSLPR/TP16P-INFINEONTECHNOLOGIES(ASIAPACIFIC)PTELTD.	
6	U1006	IC,RFAmplifier	EUSY0365401	BGA711L7-0.3~3.62.7-3.0NA0W0WNA0TSLPR/TP7P-INFINEONTECHNOLOGIES(ASIAPACIFIC)PTELTD.	
6	IC1	IC,AnalogMultiplexer	EUSY0372001	TS5USBA33402YZPRTS5USBA33402,WCSP,20,R/TP,MUICTEXASINSTRUMENTSKOREALTD,HONGKONGBRANCH.	
6	U400	IC,VoltageDetector	EUSY0374601	MAX14528MAX14528,TDFN,8,R/TP,ProgrammableOVPMAXIMINTEGRATEDPRODUCTSINC.	
6	U1007	IC,SubPMIC	EUSY0378001	AAT2862AAT2862,TQFN34,24,R/TP,3x4x0.8AdvancedAnalogicTechnologiesHKLimited	
6	U601	IC,TTL	EUSY0391601	NLSV1T244-D0.9~4.5V-LEVELSHIFTER-R/TP6P-SCGHONGKONGSARLTD.	
6	U200	IC,DigitalBasebandProcessor,3G	EUSY0392302	MSM72270VTO0V0WBGAR/TP560P-QUALCOMMINCORPORATED.	
6	IC500	IC,AudioSubSystem	EUSY0403901	WM9093ECS/R1.71~5.5V0WWLCSPR/TP20P-WOLFSONMICROELECTRONICSPLC	
6	U602	IC,AudioAmplifier	EUSY0404001	TPA6202A1ZQVRBGA,8,R/TP,ClassABSPKAmp,IC,AudioAmplifierIC,AudioAmplifierTEXASINSTRUMENTSKOREALTD,HONGKONGBRANCH.	
6	U501	IC,LDOVoltageRegulator	EUSY0407101	BU28TD4WNVXSSON004,4,R/TP,2.8V150mASingleLDO,IC,LDOVoltageRegulatorIC,LDOVoltageRegulatorROHM.	
6	U401	IC,LDOVoltageRegulator	EUSY0407201	BU33TD4WNVXSSON004,4,R/TP,3.3V150mASingleLDO,IC,LDOVoltageRegulatorIC,LDOVoltageRegulatorROHM.	
6	U502	IC,LDOVoltageRegulator	EUSY0407501	BU18TD4WNVXSSON004,4,R/TP,1.8V150mASingleLDO,IC,LDOVoltageRegulatorIC,LDOVoltageRegulatorROHM.	
6	U202	IC,TTL	EUSY0408201	74LVC1G79GM1.65~5.5V-DFLIP-FLOPSOTR/TP6P-STCCORP.	
6	U503	IC,AccelerationSensor	EUSY0408701	KR3DHNONENONELGAR/TP16P-STMICROELECTRONICSASIAPACIFICPTELTD.	
6	U1	IC,A/DConverter	EUSY0418501	AMI304QFN,12,R/TP,GeomagneticSensor,IC,A/DConverterIC,A/DConverterAICHISTEELCORPORATION	
6	U301	IC,MCP,NAND	EUSY0426801	MT29C4G96MAZAPCJA-5ITFBGA,137,ETC,4G(LB/256Mx16)NAND+4G(DDR400/16Mx4x32*2_2CS_2CKE)SDRAM,;,IC,MCPMICRONSEMICONDUCTORASIAPTELTD.	
6	X200	Oscillator,VCTCXO	EXSK0008901	KT3225L19200DCW28RA019.2MHZ2PPM2.8V0.0x0.0x0.0MMNONESMDR/TPKYOCERACORP.	
6	X500	Oscillator,TCXO	EXST0001901	TG-5010LH-87N26MHZ2.5PPM2.8V32.0x25.0x10.0MM-SMDR/TPEPSONTOYOCOMCORP	
6	X400	Crystal	EXXY0026801	NX3215SA32.768KHZ20PPM0FNONESMDR/TPNIHONDEMPAKOGYOCO.,LTD.	
6	R207	WirePad,Open	SAFO0000501	AX3100ATLSV_SHIPBACK,MAIN,A,0OHM_1005_DNI	

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Level	LocationNo.	Description	PartNumber	Spec	Remark
6	R10,R1015, R14,R19, R8	WirePad,Short	SAFP0000401	AX3100ATLSV_SHIPBACK,MAIN,A	
6	R1,R26, R29,R301, R303,R304	WirePad,Short	SAFP0000501	LG-VS760VRZ	
6	FL1008	Filter,Duplexer,IMT	SDMY0001901	SAYFP1G95AA0B00SAYFP1G95AA0B00,1950MHz,2140MHz,1.8dB,2.4dB,52dB,43dB,2.5*2.0*0.55,SMD,Band1,2520size,SAW,RxunbalMURATAMANUFACTURINGCO.,LTD.	
6	FL2	Filter,Duplexer,IMT	SDMY0002901	SAYFP897MBA0B00942500000925to960897500000880to9153.532.5x2.0x0.55DUALSMDR/TP-MURATAMANUFACTURINGCO.,LTD.	
6	VA607	Varistor	SEVY0004301	ICVL0518100Y500FR18V0%10F1.0*0.5*0.55NONESMDR/TPINNOCHIPSTECHNOLOGY	
6	VA200, VA201, VA202, VA203, VA204, VA205	Varistor	SEVY0004401	ICVL0518400V500FR18V0%40F1.0*0.5*0.55NONESMDR/TPINNOCHIPSTECHNOLOGY	
6	VA1,VA2, VA609, VA610	Varistor	SEVY0008101	EVLC5S01033EVLC5S01033,5.5V,,SMD,0603AMOTECHCO.,LTD.	
6	R1016, R1017	Filter,Bead	SFBH0007102	BLM15AG100PN110ohm1.0x0.5x0.55SMDR/TP2PMURATAMANUFACTURINGCO.,LTD.	
6	FB500, FB501, FB502	Filter,Bead	SFBH0008102	BLM15HD182SN118001.0x0.5x0.5MMSMDR/TP2PMURATAMANUFACTURINGCO.,LTD.	
6	R208	Filter,Bead	SFBH0009601	HB-1T1005-221JT220ohm1.0*0.5*0.5SMDR/TP2PCERATECHCORPORATION	
6	FB600, FB602, FB603	Filter,Bead	SFBH0009901	HB-1M1005-121JT1201.0x0.5x0.5MMSMDR/TP2PCERATECHCORPORATION	
6	FL600, FL601, FL602	Filter,EMI/Power	SFEY0011401	ICVE10184E070R101FRESD/EMI0HZ7.5pF0HSMDR/TPINNOCHIPSTECHNOLOGY	
6	FL400	Filter,EMI/Power	SFEY0015301	NFM18PC104R1C3ESD/EMI0HZ0.1uF0HSMDR/TPMURATAMANUFACTURINGCO.,LTD.	
6	FL603	Filter,EMI/Power	SFEY0015901	ICMEF214P101MFRICMEF214P101MFR,SMD,ESDCommonmodeFilterINNOCHIPSTECHNOLOGY	
6	FL1013	Filter,EMI/Power	SFEY0016301	ICMEF112P900MCOMMONMODENOISEFILTER0HZ0F0HSMDR/TPINNOCHIPSTECHNOLOGY	
6	FL1001	Filter,Saw,Dual	SFSB0001802	SAWEN881MCN0F00881.5MHz,1960MHz1.8*1.4*0.5SMDR/TP10PMURATAMANUFACTURINGCO.,LTD.	
6	FL1002	Filter,Saw,Dual	SFSB0001902	SAWEN1G84CN0F001842.5MHz,1960MHz1.8*1.4*0.5SMDR/TP10PMURATAMANUFACTURINGCO.,LTD.	
6	FL1	Filter,Saw	SFSY0024301	SAFEB942MFL0F00942.51.4*1.1*0.6SMDR/TP5PMURATAMANUFACTURINGCO.,LTD.	
6	FL1007	Filter,Saw	SFSY0027101	B7742----5PEPCOSPTELTD.	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	FL1006	Filter,Saw	SFSY0028101	SAFEB1G95KA0F0019501.4*1.1*0.6SMDR/TP5PMURATAMANUFACTURINGCO.,LTD.	
6	FL1003	Filter,Saw	SFSY0028201	SAFEB2G14FB0F00----2PMURATAMANUFACTURINGCO.,LTD.	
6	FL1005	Filter,Saw	SFSY0037501	SAFEB897MAM0F00897.5MHz1.4*1.1*0.6SMDR/TP5PMURATAMANUFACTURINGCO.,LTD.	
6	FL1011	Filter,Saw	SFSY0039301	SAFEB2G14AL0F002140MHz,1.4*1.1*0.6,SMD,2110M~2170M,IL3.5,5pin,U-U,50-50,W-BANDIRxDIVERSITY,2140,1.4*1.1*0.6,SMD,R/TP,2140,1.4*1.1*0.6,SMD,R/TPMURATAMANUFACTURINGCO.,LTD.	
6	U1003	IC,PowerAmplifier	SMPY0020001	SKY77195SKY77195,28dBm,%,A,dBc,dB,4x5,SMD,3GDualPAMBand1+8.CPLintegratedSKYWORKSSOLUTIONSINC.	
6	U1002	RFModule	SMRH0006201	SKY77544MHz,MHz,POLAEDGEQUADTXMODULE,SP9T,6.0*6.0*1.0,28p,SKYWORKSSOLUTIONSINC.	
6	U500	Module,WLAN	SMZY0024901	LBEH19UNBC-3382.3VTO5.5VLGA54P9.0x7.8x1.3MMMURATAMANUFACTURINGCO.,LTD.	
6	U1004	IC,RFAmplifier	SMZY0025501	RF28153.3*2.1*1.0,FILTER+GPSLNA+FILTERMODULE,GPS,RFMICRODEVICESINC	
5	SAFD	PCBAssembly,Main,SMTTop	EBR72701301☞19	LG-P500MAIN1.0	
6	C201	Capacitor,Ceramic,Chip	ECCH0000122	MCH155A470JK47pF5%50VNP0-55TO+125C1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	C1931	Capacitor,Ceramic,Chip	ECCH0000198	CL05A225MQ5NSNC2.2uF20%6.3VX5R-55TO+85C1005R/TP.SAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C707	Capacitor,Ceramic,Chip	ECCH0004904	GRM155R60J105K1uF10%6.3VX5R-55TO+85C1005R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	C705	Capacitor,Ceramic,Chip	ECCH0007803	CL10A106MP8NNNC10uF20%10VX5R-55TO+85C1608R/TP0.8MMSAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C709	Capacitor,Ceramic,Chip	ECCH0017601	CL05A475MQ5NRNC4.7uF20%6.3VX5R-55TO+85C1005R/TP0.5MMSAMSUNGELECTRO-MECHANICSCO.,LTD.	
6	C202,C708	Capacitor,Ceramic,Chip	ECZH0003103	GRM36X7R104K10PT100nF10%10VX7R-55TO+125C1005R/TP-MURATAMANUFACTURINGCO.,LTD.	
6	LD1,LD2,LD3,LD4	LED,Chip	EDLH0014803	SSC-WH107WHITE2.7~3.120mA100~230mcdx,y64mW1608R/TP2P-SEOULSEMICONDUCTORCO.,LTD	
6	Q601	FET	EQFP0004501	SI1305-E3P-CHANNELMOSFET-8V+-8-0.92A0.28OHM340mWSOT323R/TP9PVISHAYINTERTECHNOLOGYASIAPTELTD	
6	R701,R702	Resistor,Chip	ERHY0000254	MCR01MZP5J4724.7KOHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1169	Resistor,Chip	ERHZ0000287	MCR01MZP5F470247KOHM1%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R700	Resistor,Chip	ERHZ0000402	MCR01MZP5J10010OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	

Level	LocationNo.	Description	PartNumber	Spec	Remark
6	R1168	Resistor,Chip	ERHZ0000407	MCR01MZP5J1051MOHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	R1172, R1173, R1174, R1175, R703	Resistor,Chip	ERHZ0000434	MCR01MZP5J1R01OHM5%1/16W1005R/TP-ROHMSemiconductorKOREACORPORATION	
6	U700	IC,Proximity	EUSY0376201	GP2AP002S00FGP2AP002S00F,8,R/TPSHARPCORPORATION.	
6	VA615	Varistor	SEVY0007902	ICVS0305500FRICVS0305500FR,5.6V,M,SMD,0603SIZEINNOCHIPSTECHNOLOGY	
6	VA611, VA612, VA613, VA614	Varistor	SEVY0008101	EVLC5S01033EVLC5S01033,5.5V,,SMD,0603AMOTECHCO.,LTD.	
6	FB700, FB701	Filter,Bead	SFBH0008102	BLM15HD182SN118001.0x0.5x0.5MMSMDR/TP2PMURATAMANUFACTURINGCO.,LTD.	
6	EAX010000	PCB,Main	SPFY0233701	SPFY0233701FR-4-LX-BUMP100.8LG-P500TMO,MAIN,F,FR-4,0.8mm,LX-BUMP10UNITECHPRINTEDCIRCUITBOARDCORP.	
6	MIC1	Microphone, Condenser	SUMY0010610	SPM0410LR5H-QBSPM0410LR5H-QB,UNIT,42dB,4.72*3.76*1.25,memsTDMAImproveKNOWLESACOUSTICS	

11.3 Accessory

Note:ThisChapterisusedforreference,Partorderisordered bySBOMstandardonGCSC

Level	LocationNo.	Description	PartNumber	Spec	Remark
2	EAC020100	RechargeableBattery, LithiumIon	SBPL0102301	LGIP-400N-WW-LGC3.7V,1500mAh,1CELL,PRISMATIC,PRISMATIC,BLACK, LGChem,LTD.	
2	EBX000000	Accessory, DataCable	SGDY0016701	KCA-ET-8-0020KCA-ET-8-0020MicroUSB,1.2MKSDCO.,LTD	
2	EAB010200	Earphone,Stereo	SGEY0003744	EMB-LGE004MSKB3mW16OHM115DB85HZTO126HZ1MBLACK 3.5LTYPESTEREO4POLEPLUG-CRESYNCO.,LTD	
2	EAY060000	Adapters	SSAD0031001	STA-U12EDSTA-U12ED,100-240V,5060Hz,5.1V,0.7A,CE,STA-U12ED,Europe,CablelessDONGDOELECTRONICSCO.,LTD	
2	EAY060000	Adapters	*S*SSAD0031003	STA-U12ES100-240V,5060Hz,5.1V,0.7A,CE,STA-U12ES,Europe,Cableless,5.1,0.7,WALL2P,USB,SALCOMPOY	
2	EAY060000	Adapters	*S*SSAD0031002	STA-U12ERSTA-U12ER,100-240V,5060Hz,5.1V,0.7A,CE,STA-U12ER,Europe,CablelessSUNLINELECTRONICSCO.,LTD	